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PAPE (H.). **Die 'Glasigkeit' oder 'Marmorierung' der Kohlrüben und ihre Bekämpfung.** ['Glassiness' or 'marbling' of Swedes and its control.]—*Dtsch. landw. Pr.*, lxiii, 48, p. 603, 2 figs., 1936.

In view of the fact that brown heart of swedes [*R.A.M.*, xvi, p. 82] has begun to cause damage in Germany, the writer briefly describes the symptoms of the disturbance and summarizes the experiments carried out in various countries on its control by the application of borax to the soil.

KADOW (K. J.) & ANDERSON (H. W.). **Brittle root of Horseradish in Illinois.**—*Plant Dis. Reptr*, xx, 18, p. 288, 1936. [Mimeographed.]

For several years the Illinois horse-radish crop has been affected by a disease known as 'brittle root', which in 1936 was responsible for losses of at least 25 per cent. in the St. Louis district. The phloem tissue of the roots, which are very friable, shows a brown to black discoloration, and the plants are wilted.

In all essential features this disorder agrees with the effect of the curly top of beet virus on horse-radish [*R.A.M.*, vii, pp. 227, 691]. The vector of curly top, *Eutettix tenella*, has not been observed in the State, but other leafhoppers occurred in profusion on the diseased stands.

FIFE (J. M.) & FRAMPTON (V. L.). **The P_H gradient extending from the phloem into the parenchyma of the Sugar Beet and its relation to feeding behaviour of Eutettix tenellus.**—*J. agric. Res.*, liii, 8, pp. 581–593, 2 figs., 2 graphs, 1936.

An account is given of experiments in which, immediately preceding or during the inoculation process with curly top [*R.A.M.*, xvi, p. 83 and preceding abstract] by the beet leafhopper (*Eutettix tenellus*) [*E. tenella*], sugar beet seedlings were exposed to an atmosphere containing a high concentration of carbon dioxide for periods varying from two to four hours. The results showed that only a small percentage of the seedlings so treated became infected, the ratio of successful infection in control seedlings to that in treated seedlings being 4·7 : 1. Treatment of the seedlings immediately following inoculation did not reduce the percentage of infection. Histological examination showed that in the petioles of the untreated beet plants 56 per cent. of the tracks of the mouth parts of the leafhopper terminated in the phloem, whereas in those of treated seedlings only 12 per cent. of the tracks ended in

this tissue, the ratio being 4·6 : 1. The striking agreement between the two ratios obtained is considered to be further evidence that the virus of curly top must be deposited in the phloem to ensure infection. Further experiments showed that *E. tenella* prefers an artificial food of P_H 8·5 to one of P_H 5·0, and tests with a microquinhydrone electrode [a description of which is given], constructed in such a way that the P_H value of the individual parenchyma cells could be determined without disturbing adjacent cells, indicated the existence in the petioles of normal beet plants of a gradient in the P_H values, extending from the phloem to the fourth or fifth parenchyma cell, the maximum change being about two units. In plants treated with carbon dioxide, on the other hand, this gradient was entirely upset or even reversed, so that the cell sap of the phloem was no more or even less alkaline than that of the parenchyma. In the treated plants the P_H gradient in the petioles returned to normal when the plants were again exposed to normal atmospheric conditions.

These results are interpreted as indicating that what at first appeared to be resistance to curly top induced in the beet plant by P_H changes in the host, may be attributed to the failure of the insect vector to locate the phloem in plants under the influence of carbon dioxide, owing to the upsetting or reversal of the P_H gradient in the petioles.

BENNETT (C. W.) & ESAU (KATHERINE). **Further studies on the relation of the curly top virus to plant tissues.**—*J. agric. Res.*, liii, 8, pp. 595–620, 10 figs., 1936.

The results of the investigations reported in this paper supported the view that the curly top virus [*R.A.M.*, xiv, pp. 549, 813; and preceding abstracts] invades the phloem of the entire vascular systems of infected beet and tobacco plants. In susceptible beet varieties the disease is characterized by necrosis of the phloem and hypertrophy and hyperplasia of the phloem and pericycle, and the liquid content of the phloem percolates through the intercellular spaces of the extra-phloem tissue, and accumulates on the surface of petioles and leaves; in the resistant U.S. 33 variety, the anatomical lesions in the phloem were less extensive, and there appeared to be very little exudation from the phloem. In diseased tobacco plants the degeneration of the phloem was similar to that in beet, but the necrotic areas became cavities, there being no proliferation, as in beet, of the cells adjacent to the necrotic spots; phloem exudation did not occur and the extra-phloem tissues showed no anatomical abnormalities.

Determination of the virus concentrations in the various organs of the resistant beet variety showed a very low content in the parenchymatous regions of the crown and flower stalk, as well as in the ventral side of the petioles, as compared with adjacent regions comprising vascular bundles. The wood and pith of infected tobacco plants also contained much less virus than tissue containing internal phloem. The virus concentration varied from very low in the immature to very high in the mature beet seed, and was apparently highest in the vascular region, though it is improbable that the virus was restricted to the phloem; no virus was recovered from the embryo [cf. ibid., xvi, p. 67]. Heavily infected seeds germinated readily, but no case of curly top

developed in 4,245 plants which were grown from seed balls collected from diseased plants and sown before the virus contained in them was inactivated (i.e., within three months). The curly top virus was recovered from the seeds, capsule walls, the placenta, and from all the flower parts of tobacco, except from the pollen or from parts of the anther devoid of vascular bundles.

These results are considered to indicate that phloem is probably the tissue in which the virus multiplies, and where it evidently attains its highest concentration. Even if the virus does occur in parenchyma cells, its concentration there is evidently very low, and the conditions are probably very unfavourable for its multiplication and spread in these cells.

LEACH (L. D.) & MEAD (S. W.). **Viability of sclerotia of Sclerotium rolfsii after passage through the digestive tract of cattle and sheep.**—*J. agric. Res.*, liii, 7, pp. 519–526, 2 figs., 1 graph, 1936.

Circumstantial evidence having indicated that *Sclerotium rolfsii*, the cause of a rot of sugar beets in the United States [*R.A.M.*, xv, p. 518], is introduced into disease-free areas by means of cattle and sheep, experiments were carried out in which seven sheep and two cows were fed with sclerotia of *S. rolfsii* in addition to their normal diet. The tabulated results showed that from 8 to 28 per cent. of the ingested sclerotia were evacuated in a whole condition in the faeces of the animals, and that from 0·7 to 15 per cent. of the evacuated sclerotia retained their viability. No viable sclerotia were evacuated by the sheep later than 84 hours and by the cows later than 108 hours after ingestion. No whole sclerotia could be found in the digestive tract of two of the sheep which were slaughtered five days after ingesting them. Sclerotia immersed in the liquid contents of sheep rumen were still viable at the end of 48 hours, and a pepsin digestive solution reduced but did not entirely suppress germination during the same period.

These experiments show conclusively that viable sclerotia of *S. rolfsii* can be introduced by sheep and cattle into uninfected fields in a quantity sufficient to cause serious losses in future crops.

Blattbräune der Rüben. [Leaf browning of Beets.]—*Dtsch. landw. Pr.*, lxiii, 43, p. 540, 1936.

According to Dr. Crüger, of the Plant Protection Headquarters, Königsberg, sugar beets and mangolds were severely attacked shortly before the 1936 harvest in many parts of East Prussia by *Cercospora beticola* [*R.A.M.*, xv, p. 337]. Serious reductions of yield from this source are seldom experienced under local conditions, but the diseased foliage is unpalatable and possibly harmful to livestock.

GIGANTE (R.). **Il mosaico del Sedano.** [Celery mosaic.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 99–114, 1 pl., 11 figs., 1936.

In February, 1936, celery growing near Rome was affected by a mosaic causing light green or yellowish chlorotic areas and dark green patches on the leaves, which were wrinkled, with irregular midribs, generally swollen underneath. Light, later dark brown, elongated areas were present on the stalks, which curved over, forming an arc.

Growth was stunted, and the leaves gradually turned yellow and withered, the plant dying before seeding, or when only a few seeds had developed. The disease was transmitted by juice inoculations and by the aphid *Cavariella pastinacae* from diseased to healthy celery and also to vegetable marrow, the symptoms on the latter host closely resembling those reported from America and Italy [*R.A.M.*, xiv, p. 489]. In nature the disease is transmitted by human agency during the usual operations, by agricultural implements, and, chiefly, by the aphid vector; it may also pass from plant to plant directly when these are in close proximity, but no evidence of transmission by seed or soil was obtained. It is thought possible that the infective agent may overwinter on weeds. The disease is considered closely similar both in its external symptoms and its histological characters to the mosaic caused by celery virus 1 [ibid., xv, p. 195], the only difference being the vector.

Control consists in the prompt destruction of infected plants, spacing out, the sterilization of implements, the systematic eradication of weeds, the removal of vegetable marrows from the vicinity, the choice of sites not visited by the aphids or of sites exposed to the wind, and the development of resistant varieties.

RODIGIN (M.). К вопросу о морфологической изменчивости **Gloeosporium lagenarium (Pass.) Sacc. et Roum.** [Note on the morphological variability of *Gloeosporium lagenarium* (Pass.) Sacc. & Roum.]—*Acta Inst. bot. Acad. Sci. U.R.S.S.*, Ser. II (*Pl. Cryptogamae*), *1936*, 3, pp. 699–713, 7 figs., 1936. [German summary.]

After briefly referring to the involved taxonomic problem represented by the genera *Gloeosporium* and *Colletotrichum*, the author gives a concise account of his researches in 1929 and 1930 at the Bykovo Plant Protection Station (Lower Volga basin) on the variability of *Gloeosporium lagenarium* [*R.A.M.*, xv, p. 698], which he isolated from anthracnose lesions on watermelon (*Citrullus vulgaris*) and cultured on a number of artificial and natural media, including tomato, apple, pear, and cucumber fruits, and apple, pear, willow, and *Melilotus officinalis* branches and stems. The results showed that on the different substrata the fungus goes through a consecutive series of morphological stages [a brief characterization of which is given], the differences between which are sufficient to warrant each stage being considered as a separate taxonomic unit. From his investigations the author concludes that the subdivision suggested by von Höhnel of the genus *Gloeosporium* is indefinite and based on unsubstantial characters; for instance, the fructifications of *G. lagenarium*, on certain substrata, may develop at the same time both over the epidermal cells (below the cuticle) and far below them. Jaczewski's genus *Pseudogloeosporium* is only a stage in the life-cycle of certain species, and cannot be retained as a distinct genus. This is demonstrated by the fact that on certain media *G. lagenarium* produces a well-developed pseudopycnidial wall. The formation or non-formation of setae in the cultures appeared to be independent of whether the isolation was made from a strain naturally abundantly provided with, or entirely devoid of, setae, and this shows that the genera *Gloeosporium* and *Colletotrichum* cannot be distinguished by the presence or absence of these organs. When cultured on

the rind of the watermelon variety 'Belokory belosemenny' [white-rinded white-seeded], *G. lagenarium* produced an abundance of gelatinous tendrils of spores which emerged from cracks in the surface; this is thought to be the first recorded observation of such tendrils in the genus *Gloeosporium*, and indicates a close relationship to the genus *Naemospora*.

On the basis of these investigations the author considers that current views on the constancy of genera and species, as taxonomic units, must be revised in the sense that these units are essentially variable and may in one way or another give rise to new forms.

Milisavlievič (D.). О узроцима пропадања Винограда у Фрушкој Гори. [On the causes of the dying-off of the Vine at Frouchka Gora.]—*Arh. Min. Poljoprivrede, Belgrad*, iii, 5, pp. 117–137, 12 figs., 1936. [French summary.]

An account is given of investigations on the widespread diseased condition of the vine at Frouchka Gora, Jugo-Slavia, frequently resulting in the death of young grafted stocks. The results showed that it is due to three different diseases, namely, 'pith disease' associated with *Pumilus medullae* [*R.A.M.*, xv, p. 631], 'broussins' [ibid., xiv, p. 676], and a bacterial gummosis, the causal organism of which was isolated and identified as *Bacillus vitivorus* [ibid., ix, p. 504] (with which *B. baccarinii* [ibid., xi, p. 281] and *Bacterium gummis* are synonymous). *P. medullae* produced in pure culture a milk-white mycelium which gradually deepened in colour and formed pycnidia after a few months; these organs, as well as spermogonia, were also produced on pieces of vine shoots placed in liquid media in flasks. Both spermogonia and pycnidia, as well as sclerotia, were found in nature but perithecia were not observed. The disease was experimentally reproduced in each of ten young grafted stocks which were inoculated at the time of grafting in the spring of 1935 with a pure culture in the graft union; the characteristic blackening of the wood and of the pith were very marked near the point of inoculation. Field observations in two localities tended to indicate that 'broussins' are caused by late spring frosts below —3° C. Inoculation experiments with *B. vitivorus* on a number of vine cuttings during 1935 resulted in the vessels becoming filled with gum and developing tyloses, and in the cuttings striking very poorly and producing malformed, chlorotic shoots. The organism was re-isolated from the infected plants. Occasionally two or all three of these diseases were observed on the same vine-stocks, a fact which has hitherto helped to obscure the real causes of the condition.

Rees (J.). **Glamorgan crop plants and their diseases.**—*Glam. County Hist.*, i, Nat. Hist., pp. 232–241, 1936.

Notes are given on diseases (mostly well-known) of cereals, pulse crops, potatoes, root, forage, and pasture crops, vegetables, and fruit in Glamorgan, among which may be mentioned mid-vein spot of red clover [*Trifolium pratense*] (*Mycosphaerella carinthiaca*), leaf spot of sainfoin [*Onobrychis sativa*] (*Ascochyta orobis* var. *onobrychidis*), and black blotch of raspberries (*Cryptosporium minimum*) [*R.A.M.*, xiv, p. 171].

MONTEMARTINI (L.). **Nuove osservazioni sui parassiti e le malattie delle piante coltivate nella Sicilia occidentale: triennio 1934–36.** [New observations on the parasites and diseases of plants grown in western Sicily: three-year period 1934–36.]—*Riv. Pat. veg.*, xxvi, 9–10, pp. 355–377, 1936.

This report on plant diseases in western Sicily [cf. *R.A.M.*, xiii, p. 424] includes, *inter alia*, the following items of interest. Wheat near Palermo was attacked by *Mastigosporium album* [*Dilophospora alopecuri*: ibid., xvi, p. 184], apparently a new record for Italy. Apple fruits were infected by *Sclerotinia fructigena* which had gained entrance through injuries caused by *Rhynchites bacchus*. Satisfactory results in the control of 'brusone' disease of loquats (*Bacillus amylovorus*) [ibid., xi, p. 117; xiv, p. 778] were given by copper sprays, and in two of the worst affected localities this method has been generally adopted. The pistachio [*Pistacia vera*] leaf spot previously reported [ibid., xiii, p. 424] was found to be due to *Septoria pistaciarum* n.sp. [without a diagnosis], the pycnidial stage of *Pleospora montemartinii*. Castor oil [*Ricinus communis*] was severely infected by *Melampsorella ricini* [ibid., xvi, p. 207], and tobacco by root rot due to *Bacillus tabacivorus*. Beans [*Vicia faba*] were attacked by *Botrytis fabae* [ibid., xvi, p. 20]. The upper surface of the leaves of *Quercus lanuginosa* var. *microspora* showed abundant infection by the perithecia of *Microsphaera quercina* [ibid., xv, p. 473], which developed in midwinter, after a fortnight's rain. The leaves of *Phormium tenax* were infected by *Cryptosporium rhodocyclum*. Forcasting stations for the issue of spray warnings against attacks of vine mildew [*Plasmopara viticola*: ibid., xvi, p. 86] are being organized.

Jahresbericht der Versuchs- und Forschungsanstalt für Wein-, Obst- und Gartenbau in Geisenheim-am-Rhein. [Annual Report of the Viticultural, Fruit Growing, and Horticultural College at Geisenheim-am-Rhein.]—*Landw. Jb.*, lxxxiii, 6, pp. 829–857, 1936.

The following items of phytopathological interest, in addition to some already noticed from other sources, occur in this report [cf. *R.A.M.*, xv, p. 479] covering the financial year 1935. Twig lesions were found by C. F. Rudloff, W. Herbst, and E. Schneiders to provide the major amount of spring inoculum of pear scab (*Venturia pirina*) [ibid., xvi, p. 45]. Some promise of effective control of the fungus by means of decoctions and extracts of representatives of the Ranunculaceae, Solanaceae, and Compositae was given by laboratory experiments. The investigations on polymorphism in *Venturia* were extended to the species infecting *Sorbus* [*Pyrus*] *aucuparia*, *S. domestica* [*P. sorbus*], and *Pyracantha coccinea* [ibid., xv, p. 230], with the result that a large number of forms were differentiated on the two first-named, while the strain on the last comprised only a few.

In connexion with the spraying experiments against apple scab (*V. inaequalis*) already reported [ibid., xv, p. 813], it is mentioned by F. Stellwaag, T. Gante, and Zimmer that Bayer's and Wacker's Kupferkalk compounds [ibid., xiv, p. 79; xv, p. 539] belong to the copper oxychloride group, and as such are more liable to induce

scorching of pome fruits [ibid., xv, p. 813] than copper arsenate preparations, e.g., nosprasit 0.

Cladosporium (*Rhacodium*) *cellare* [ibid., xv, p. 631] was found by K. Kroemer and H. Schanderl to be entirely innocuous in the wine cellar, since growth was inhibited in nutrient solutions containing 3 per cent. alcohol by volume. On the other hand, it should be stringently excluded from sweet must cellars, where it may do considerable damage, being capable of assimilating ethyl and amyl alcohol and converting them into fats.

The intracellular cordons associated with the 'reisig' disease of vines [ibid., xv, p. 497] were detected by K. Kroemer, H. Moog, and G. Troost in a number of other woody plants, including *Acer pseudoplatanus*, birch (*Betula alba* and *B. verrucosa*), *Corylus avellana*, pines (*Pinus sylvestris* and other species), poplar (*Populus* spp.), *Vitis heterophylla*, apricots, cherries, plums, mirabelles [*Prunus divaricata*], peaches, and currants.

GALLOWAY (L. D.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst. Pusa*, 1934–35, pp. 120–130, 1936.

During the period under review confirmation was obtained of earlier observations indicating that wheat bunt [*Tilletia caries*, *T. foetens*, and *T. indica*] does not develop even from heavily inoculated seed under Pusa conditions [*R.A.M.*, xv, p. 7]. Evidence of soil-borne infection was obtained at Karnal.

Examination of 'black point' wheat seed showed that 70 per cent. of the seed contained *Helminthosporium sativum* [ibid., xv, p. 703], while others contained *H. tritici-repentis*, an *Alternaria*, and a *Fusarium*. The mycelium was present within the seed-coat and was not destroyed by surface sterilization.

Examination of smutted oats from 24 areas in northern India confirmed the view that the predominant oat smut in that locality is *Ustilago kolleri*. Seed for nearly 100 acres treated two or three weeks before sowing with formalin dry spray yielded under 0·01 per cent. infection, compared with 4 per cent. for untreated seed in previous years [ibid., xiv, p. 160].

When seed from rice plants infected with *Ustilaginoidea virens* [ibid., xiii, p. 652] was grown in pots of normal soil, and healthy seed was grown in pots of artificially infected soil, no disease resulted, confirming the view that *U. virens* is neither seed- nor soil-borne.

In December, 1933, a severe root disease of tobacco resembling black shank occurred in Madras; comparisons of isolations from the infected material with cultures of *Phytophthora parasitica* var. *nicotianae* [ibid., xiv, p. 608] from Florida and Java showed that though slower in growth they agreed well with the latter. At Pusa mortality due to the Madras fungus was low or nil in winter, but very high from April to October on seedlings in infected soil.

Preliminary investigations of potato types suitable for northern India showed the following diseases to be important locally, viz., tip or hopperburn, *Alternaria* blight [*A. solani*], *Rhizoctonia* rot (*R.* [*Corticium*] *solani*), (possibly) *Fusarium* wilt, and leaf roll, streak, crinkle, and other mosaic diseases. On the tubers *Spongospora subterranea*, *C. solani*, and *F. oxysporum* were observed. Bacterial rot was common in

storage, one of the types frequently found agreeing with *Bacterium solanacearum*. Symptoms resembling spraing [ibid., xv, p. 468] were observed.

A white rot of grape vines occurred at Pusa, apparently due to a new species of *Coniella*. The stems and leaves became brown and shrivelled, and in advanced cases the berries turned brownish-grey and dried up. The one-celled, hyaline, later dark brown conidia were borne all round the inner surface of the pycnidia; perithecia were also found. Inoculation tests showed that infection can occur through wounds.

To determine whether the stimulation of oospore production in certain strains of *Phytophthora* grown in association with another strain is due to chemical stimulation or to heterothallism, an unheated filtrate from a paired culture of *P. meadii* and *P. colocasiae* (strains not producing oospores) that had formed oospores was added to quaker oat agar, and plate cultures of the species grown separately. *P. meadii* in the presence of the filtrate formed amphigynous oospores at 23° C.; *P. colocasiae* formed a few oospores at a higher temperature only.

Examinations of different soils from Pusa and of two from other sources showed *Cladosporium* and *Fusarium* to be frequently present; other isolations included *Rhizopus arrhizus*, *Cunninghamiella* sp., *Chaetomium indicum*, *Alternaria* spp., *H. sativum*, *Acrothecium lunatum* [*Curvularia lunata*: ibid., xvi, p. 156], and *Phoma*, *Melanconium*, *Byssochlamys*, and *Trichosporium* spp. [ibid., xv, p. 824].

In the second part of this report it is stated that in further experiments on the effect of sugar-cane mosaic on tonnage [ibid., xiv, p. 257] diseased Co. 213 canes yielded approximately 10 per cent. less stripped cane than the healthy cane. The sugar-cane varieties Co. 205, 346, 349, 368, 380, 381, and 391 were found to be infected by smut (*U. scitaminea*) [ibid., xiii, p. 473] at Karnal. The fungus was isolated from Co. 205, 213, 290, 368, and 391, and grew well on potato dextrose, Richards's, and Dox's agars. In culture, chlamydospores were rare, but secondary sporidia formed freely. Infection of P.O.J. 2878, Co. 416, and Co. 419 was obtained by infecting the buds of setts with spores or sporidia; in one case infection took place through the cut ends.

Annual Report of the Mycological Section for the year ending the 31st March 1936.—*Rep. Dep. Agric. Cent. Prov. Berar*, pp. 26–29, 1936.

In an experiment carried out at Nagpur, India, cotton seedlings in untreated control plots showed 7·8 per cent. deaths from anthracnose [*Glomerella gossypii*: *R.A.M.*, xvi, p. 173], as against only 3·8 per cent. in a plot sown with seed delinted with sulphuric acid.

Sorghum seed dusted with copper carbonate, sulphur (1 oz. per 24 and 48 lb. seed), abavit B, ceresan (1 oz. per 28 lb.), or agrosan G (1 oz. per 10 and 20 lb.) gave 0·08 to 0·2 per cent. covered smut (*Sphacelotheca sorghi*) [ibid., xvi, p. 87], as against 11·2 per cent. in the untreated control plot.

The groundnut disease caused by *Cercospora personata* and *C. arachidicola* [ibid., xv, pp. 2, 284] was effectively controlled by the application of Bordeaux mixture 2–2–50 plus linseed oil or agral I at the beginning of August and a month later; a third spray should be given if the weather is very wet.

Damping-off of tobacco seedlings caused by a species of *Phytophthora* was observed at Nagpur in the beginning of October, 1935, but was completely checked by the removal of the infected plants and irrigation of the beds with Bordeaux mixture (4–4–50).

Tenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1936.—96 pp., 1936.

In this report it is stated that boric acid applications markedly reduced the incidence of internal cork in the Sturmer Pippin and Granny Smith apples, but had no appreciable effect on the Cleopatra variety [*R.A.M.*, xv, p. 481; xvi, p. 186].

In storage investigations with Jonathan apples in Victoria it was found that the maximum development of scald [ibid., xvi, p. 107] occurred in the samples delayed for four days at 65° before being stored at 32°. Scald incidence decreased as the delay period increased, and susceptibility appeared to be greatest during the climacteric. The condition occurred mainly at 32° and, to some extent, at 34° in fruit from two localities picked at the green-yellow stage. Colour was less important, however, than date of picking, for green-yellow apples picked in late March developed scald while similarly coloured fruit picked three weeks later remained unaffected. Scald appears to be a low temperature disorder affecting certain fruits and largely controllable by delayed storage before storage at 32°, or by storage at 36°. Storage atmospheres containing 5 per cent. of carbon dioxide did not affect the incidence of soft scald and breakdown in more mature Jonathan apples, but reduced breakdown in apples of the first picking. When atmospheres containing 10 per cent. of carbon dioxide were used brown heart [ibid., xvi, p. 185] began to appear.

Investigations into the strains and saltants of *Gloeosporium musarum* [ibid., xv, p. 451] showed that one strain was isolated so frequently as to indicate that it was the only one of economic importance. Inoculations into green bananas in the field suggested that infection by *G. musarum* can take place through injuries in immature fruit. It was also found that fruit from plantations with an average of up to three dead leaves per plant developed significantly less infection than fruit from plantations averaging more dead leaves per plant, the pustules of *G. musarum* on dead and dying leaves being apparently the source of infection.

The high percentage of wastage by blue and green moulds [*Penicillium italicum* and *P. digitatum*] observed in the packing sheds on citrus fruits from the Gosford area was ascertained to be due to the fact that atmospheric contamination was favoured by humidity and temperature. It was shown that the more serious 'rub' type of injury can be reduced by suitable modifications by 60 per cent., and further work should aim at the elimination of wounding since it is practically impossible to exclude mould from the orchards. In Washington Navel and common oranges picked on three dates and stored at temperatures ranging from 34° to 50° F. the chief defects of the rind responsible for wastage were storage spot [pitting: ibid., xv, p. 498], scald [loc. cit.], goose-flesh, and skin collapse. Both lateral and stem-end storage spot occurred chiefly in fruit picked early and stored at 40°, and was largely

controlled by the use of higher storage temperatures and (to some extent) by sweating at 70° before storage at 40°. Scald and gooseflesh are low temperature disorders which occur at 37° and 34°, respectively, and are controllable by storage at higher temperatures. Skin collapse appeared to be a normal disorder accompanying the last stages of senescence.

A preliminary survey of tobacco virus diseases in Tasmania and Victoria showed that spotted wilt was the most serious tobacco disease in Tasmania [ibid., xv, p. 689] and that mosaic was common but comparatively unimportant in both States. Spotted wilt was observed for the first time at Shepparton and Eurobin, Victoria.

Experimental evidence showed that applications of nitrogenous fertilizers controlled root rot of peas [*Aphanomyces* sp.: ibid., xiv, p. 425], the increased yields obtained being sufficiently large to indicate that the treatment may be commercially practicable.

Pine trees affected with needle-fusion [ibid., xv, p. 481] appeared to recover when replanted in good soil, but became diseased again when put back into poor soil.

HANSFORD (C. G.). **Annual Report of the Mycologist, 1935.**—*Rep. Dep. Agric. Uganda, 1935–36.* (Part II), pp. 40–42, 1936.

The cotton wilt associated with a species of *Fusarium* [*?vasinfectum*: *R.A.M.*, xv, p. 426] in the Buganda Province, Uganda, which has hitherto been sporadic, is now commonly attacking groups of plants in many native plots, though the effect on the cotton crop as a whole is still negligible. In the field the only diagnostic symptom is the presence of yellow to brown streaks running longitudinally through the woody tissues of the stems and roots. Many plants of all ages and sizes even late in the season show a sudden wilting of the leaves, followed by a browning of the leaf blades between the main veins, beginning at the margin. These leaves quickly dry up and fall. In a more obscure or 'chronic' form of the disease the plants merely appear to be poorly developed, and produce little or no crop.

For three seasons attempts have been made to develop disease-resistant plants by selecting seed from resistant individuals grown in heavily infected plots, and a system is being developed whereby seedlings resistant when grown in inoculated soil in the laboratory are transferred to the field. In many instances, seeds of susceptible varieties planted in pots containing inoculated soil failed to germinate. The tissues inside were found to be invaded by the fungus, a rot being set up which attacked the young root and finally involved all the tissues of the embryo. In other cases germination occurred and the cotyledons appeared above the soil, but little further growth took place and the seedlings died; though fair development of the shoot had taken place in three plants, the root system remained almost entirely undeveloped. Susceptible plants which escaped these two types of infection showed more typical symptoms. As a rule, infection occurred on the hypocotyl and resembled sore shin, hitherto attributed locally to *Rhizoctonia* [*Corticium*] *solani*. The surface of the infected tissues was reddish, later dark brown. A number of different strains of *Fusarium* which were isolated from the discoloured streaks are being tested for pathogenicity.

In an appendix (by H. R. Hosking) it is stated that the cotton varieties S.P. 20 and S.P. 72 showed less blackarm [*Bacterium malvacearum*] in variety trials than N.17 and S.G. 29. The most satisfactory method of estimating the degree of infection by blackarm was by determining the number of lesions per lb. of plant tops cut off at ground level, this figure representing 'intensity of infection'. Results obtained by this method indicated that close spacing increased intensity and that the earlier the sowing date the higher the intensity of the disease.

LOPATIN (M. I.). Поражаемость растений возбудителем корневого рака растений **Bact. tumefaciens.** [The susceptibility of plants to the agent of crown gall of plants, *Bact. tumefaciens*.]—Микробиол. [*Microbiol.*], v, 5, pp. 716–724, 1936. [English summary.]

Only 21 out of 101 species of plants belonging to 32 families showed apparent immunity from crown gall (*Bacterium tumefaciens*) in the writer's inoculation experiments at the Uman Agricultural Institute [province of Kieff] from 1931 to 1934, viz., *Centaurea cyanus*, *Chrysanthemum indicum*, *Salvia verticillata*, soy-bean, French bean (*Phaseolus vulgaris*), *Lathyrus odoratus*, *Rosa canina*, *Papaver rhoeas*, *P. somniferum*, *Chelidonium majus*, barberry, lime (*Tilia parvifolia*), peony, *Buxus sempervirens arborescens*, *Heliotropium suaveolens*, *Primula obconica*, *P. chinensis*, *P. malacoides*, *Pentstemon hybridum*, *Cactus*, and *Arum*. Among the very susceptible species were tomato, *Datura stramonium*, sunflower, beet (excessively severe infection) [*R.A.M.*, xv, p. 133], cucumber and other cucurbits, *Pelargonium zonale* [ibid., xv, p. 782], hemp, and *Ricinus communis*.

DAVYDOFF (P. G.). Машины для протравливания зерна. [Cereal seed-grain disinfecting machines.]—*Mechanization of Plant Protection, Bull. Pl. Prot. Leningr., Ser. III* (*Control measures and implements*), *1936*, 8, pp. 97–122, 6 figs., 10 graphs, 1936.

A detailed and fully tabulated account is given of the results obtained from tests of seven cereal seed-grain disinfecting machines of Russian construction [cf. *R.A.M.*, xvi, p. 23], which showed that, after some minor structural defects have been remedied, Borghardt's combined apparatus for wet, semi-dry, and dry treatment of the seed, capable of treating up to 21 tons per 10-hour day, is the best adapted for medium and large estates. Satisfactory results were also obtained with Popoff's dusting apparatus [ibid., xiv, p. 47], capable of an output of 6 or 7 tons per hour with 9 attendants. Mention is also made of P. N. Davydoff's apparatus for treating the seed with formaldehyde vapours, which does not affect injuriously the germinability of the seed; the apparatus in its present form presents, however, some defects, such as not being gas-tight, and inadequacy of the formalin solution heating contrivance, but could be usefully employed if these were remedied. None of the other machines tested was satisfactory.

HASSEBRAUK (K.). **Die Ergebnisse der Getreiderostforschung der letzten 10 Jahre.** [The results of cereal rust research during the last 10 years.] —*Forschungsdienst*, ii, 10, pp. 503–517; 11, pp. 568–581, 1936.

This is a critical review of the literature published in various countries

during the last ten years (up to July, 1936) on different aspects of cereal rust (*Puccinia* spp.) research. Many of the papers included in the bibliography of 633 titles have been noticed from time to time in this *Review*.

GASSNER (G.) & HASSEBRAUK (K.). **Untersuchungen zur Frage der Getreiderostbekämpfung mit chemischen Mitteln.** [Investigations on the question of cereal rust control by chemical means.]—*Phytopath. Z.*, ix, 4, pp. 427–454, 1936.

A detailed, fully tabulated account is given of greenhouse experiments in the control of cereal rusts (chiefly form 14 of *Puccinia triticina* [*R.A.M.*, xiv, p. 748] on Strube's Squarehead wheat and form 2 of *P. simplex* [*P. anomala*: ibid., xiv, p. 624] on Friedrichswerth Berg winter barley) by the application to the surface soil of the pots, after sowing the seed, of 174 organic compounds, at rates of 1·2, 12, 24, and 120 mg. per kg. soil, the subsequent development of the rusts being recorded after a certain length of time according to a key [which is described]. Of the chemicals tested only a small number effectively inhibited rust development. Certain promising materials, including chloranil, dimethylcumanon, α-naphthol [ibid., xiii, p. 790], and nitrodibrombenzol, were found to owe their efficacy to the evolution of volatile toxic substances which inhibit spore germination without damaging the host tissues, and the possibility of utilizing such preparations for dusting the growing crop is briefly discussed. Other preparations were effective though not forming gas, e.g., acridin (against wheat rust only), 1-brom–2-naphthol, picric acid, and p-toluolsulphochloramide sodium; in some cases the roots apparently assimilate sufficient quantities of the compounds to induce an internal therapeutic action. Nitrodibrombenzol exerted a stronger repressive action on *P. anomala* than on *P. triticina*, whereas acridin and tolan acted in the opposite manner. The possibility of chemical immunization of cereals against rusts was strengthened by supplementary tests in which the compounds were incorporated with the soil in the pots instead of being strewn over the surface. The incidence of *P. triticina* and *P. graminis* (form 79) on a number of wheat varieties was further reduced by the suspension of the leaves in solutions of sodium sulphide (up to 1 per cent.), but in some cases this beneficial effect was counteracted by necrotic injuries.

It is emphasized that the conclusions to be drawn from these experiments are so far purely theoretical and cannot be applied on a practical basis pending further investigations.

GASSNER (G.) & STRAIB (W.). **Untersuchungen zur Bestimmung der Ernteverluste des Weizens durch Gelb- und Schwarzrostbefall.** [Investigations on the determination of harvest reductions in Wheat through yellow and black rust infection.]—*Phytopath. Z.*, ix, 5, pp. 479–505, 4 diags., 1936.

In order to determine the yield reductions caused by *Puccinia glumarum* and *P. graminis* in wheat varieties of differing reaction to these rusts, the writers laid out the plots for inoculation in the midst

of a stand of oats, the control plots being situated at a distance of 28 m.

In 1930 a moderately severe attack of yellow rust, lasting from the end of May to the end of June, resulted in a reduction of 14 per cent. in the grain yield of the susceptible Red Schlanstedt, while in 1931 the losses in the three susceptible varieties, Ackermann's Bayernkönig, Pflug's Baltic, and Strube's Squarehead, ranged from 11 to 18 per cent. under comparable infection conditions persisting from the middle of May to the middle of June. The grain reduction in Heine's Club summer wheat grown in pots in the open in 1933 and exposed to a severe five-week epidemic of *P. glumarum* amounted to 25 per cent., the corresponding figure for Oregon being 14 per cent. In parallel experiments with black rust, a comparatively severe attack, lasting about a fortnight, caused losses of 24 and 14 per cent., respectively, in the two summer wheats, Red Schlanstedt and v. Rümker's Squarehead.

The 'injury coefficient' was calculated on the percentage yield reduction induced by each week's rust attack of a certain degree of severity, on which basis moderately heavy infection of wheat by yellow rust during the actual vegetative period of the crop caused a weekly loss of 3 per cent., the corresponding figure for a severe epidemic being 5 per cent. For black rust the figures are still higher, but in practice the effects of the latter are ordinarily less noticeable, since severe infection, under German conditions, does not usually develop until shortly before the harvest.

The years selected for these experiments were not typical 'rust years', and the figures obtained probably do not by any means represent the maximum losses to be expected. A deterioration in the quality of the grain was observed to accompany the reduction in yield. Although the losses from rusts are relatively less heavy in resistant than in susceptible varieties, the exclusive cultivation of the former, irrespective of local conditions, is not to be recommended, experience having shown that, in certain localities, the yield of susceptible wheats may exceed that of resistant. In this connexion attention is drawn to the importance of the annual varietal cultivation tests conducted by the Reich Food Board.

HASSEBRAUK (K.). **Pilzliche Parasiten der Getreideroste.** [Fungal parasites of the cereal rusts.]—*Phytopath. Z.*, ix, 5, pp. 513–516, 1936.

Hitherto the only fungi known to parasitize the uredosori of the cereal rusts (*Puccinia* spp.) were *Olpidium uredinis* and *Darluca filum* [*R.A.M.*, xv, p. 528], but the writer has observed *Verticillium niveostratosum* parasitizing *P. graminis*, *P. glumarum*, and *P. triticina*, and *Cephalosporium acremonium* parasitizing *P. graminis*. A verticillate fungus found on *P. coronifera* [*P. lolii*] was ascertained by Wollenweber to agree in essentials with *Acrostalagmus fungicola*, which is renamed, in view of the prospective amalgamation of *Verticillium* and *Acrostalagmus*, *V. fungicola* n.comb. *P. lolii* was also parasitized by an organism of uncertain identity, possibly a species of *Fusidium*, *Spicaria*, or *Cylindrium*. A *Verticillium* with a snow-white mycelium of a more compact and felt-like consistency than that of *V. niveostratosum* and

spherical (3·6 μ) or tapering conidia, occurs on *P. glumarum* and *P. simplex* [*P. anomala*].

Greenhouse inoculation experiments with the rust parasites gave positive results only on plants permanently maintained in a saturated atmosphere. *V. niveostratosum* produced heavy infection on *P. graminis*, *P. triticina*, *P. glumarum*, *P. lolii*, and *P. anomala*, *P. dispersa* [*P. secalina*] being less heavily involved. The uredosori, if formed at all, were covered with a white, somewhat crusty-looking mycelium, and produced no viable spores. *C. acremonium* attacked all the rusts except *P. secalina*, covering the entire zone of infection with its abundant, loose mycelium, several millimetres in thickness; *P. anomala* and *P. lolii* produced teleutospores or black spots in place of uredospores. *V. fungicola* also parasitized all the rusts, *P. secalina* again being the most resistant. Symptoms similar to those induced by the foregoing and *V. niveostratosum* were caused by the two unidentified fungi. In a further series of trials, *V. niveostratosum* parasitized *P. suaveolens* [ibid., viii, p. 791; xiv, p. 52], *P. symphyti-bromorum* [ibid., xii, p. 499], *P. taraxaci*, and *P. asparagi* [ibid., xv, p. 627] in addition to *P. graminis*.

Owing to their exacting moisture requirements there is no question of utilizing the fungi under observation for practical rust control. They are apt, however, to constitute a hindrance to the multiplication of the rusts for experimental purposes in the greenhouse, especially during the dark winter months. Airing the plants by removal of the covering bell jars 48 hours after inoculation reduces the incidence of the parasites, but this measure is inapplicable to *P. glumarum*, for the development of which abundant humidity is requisite.

Schilcher (E.). **Rostbekämpfung mit Kalkstickstoff.** [Rust control with calcium cyanamide.]—*Landeskultur*, iii, pp. 176–178, 1936. [Abs. in *Z. ges. Getreidew.*, xxiii, 10, p. 208, 1936.]

Disappointing results have again been obtained [in Austria] in experiments with calcium cyanamide for the control of brown rust of wheat [*Puccinia triticina*: *R.A.M.*, xiv, p. 500]. At the most the compound exerts a retarding influence on the development of the disease, which is counteracted by more or less severe scorching of the plants.

Asuyama (H.). **Widerstandsfähigkeit von gewissen japanischen Weizen gegen zwei biologische Typen des roten Rostpilzes.** [The resistance of certain Japanese Wheats to two biologic forms of the red rust fungus.]—*J. Pl. Prot.*, xxii, pp. 179–185, 1935. [Japanese. Abs. in *Jap. J. Bot.*, viii, 3, p. (39), 1936.]

The results of inoculation experiments with two biologic forms of *Puccinia triticina*, one from Akita and the other from Saitama [*R.A.M.*, xiv, pp. 59, 299], revealed differences not only among the Japanese wheats tested in their reaction to the rust forms, but the same varieties showed diverse degrees of resistance according to the locality of origin. A variety distinguished by marked resistance in the seed-bed behaved similarly in the field.

Safronova (Mme N. I.). Сравнительная оценка некоторых методов экспертизы семян Пшеницы на мокрую головню (**Tilletia tritici**). [Comparative studies of certain methods for the detection of bunt (*Tilletia tritici*) infection in Wheat seed-grain.]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 115–128, 1936.

Comparative tests and statistical analyses are described of Lobik's original method for detecting the presence of bunt (*Tilletia tritici*) [*T. caries*] spores in wheat seed-grain, and of the same method as modified in 1931. According to the original method two samples each of 100 grains are separately washed for ten minutes in 10 c.c. of water; a calibrated drop of the spore suspension is then placed on a glass slide under a cover glass, and the spores are counted in 15 optical fields taken on two diagonals of the preparation, the actual spore load per grain being calculated from the average number of spores in the optical fields in the two samples, multiplied by a constant coefficient representing the number of drops per c.c., and divided by 100. The modification of the method introduced in 1931 consists in centrifuging the spore suspension obtained from the samples, diluting the spore sediment in 5 c.c. of distilled water, and computing the spore load as above mentioned. The results showed that the latter method is more sensitive than the former, being able to detect differences in infection of the order of 1 in 100,000; the spore load per grain is always considerably higher as calculated by the original method than by the modified method and the latter gives much narrower fluctuations, e.g., for 0·01 per cent. (by weight) artificial infection the original method gave from 526 to 1,185 spores per grain and the modification 235 to 470 spores. A third method, suggested by Khodakovsky in 1931, consisting in the direct count of the spores present on a wheat grain with the help of a binocular microscope is not considered practical, since it is too lengthy, extremely trying to the eyesight, and inaccurate with heavy contaminations.

Artificial grain inoculation experiments with a wheat which naturally gave 0·21 per cent. bunt infection in the field, showed that the amount of resulting bunt increased progressively with the quantity of spores added, e.g., added spore loads of 0·005, 0·03, 0·1, and 0.5 per cent. (by weight) resulting in 1·44, 10·46, 25·56, and 71·16 per cent. infection, respectively.

Milan (A.). **Intorno alla simultanea presenza dei parassiti 'Tilletia tritici' (Bjerk.) Wint. e 'Ustilago tritici' (Pers.) Jens. su piante di Frumento.** [On the simultaneous presence of the parasites *Tilletia tritici* (Bjerk.) Wint. and *Ustilago tritici* (Pers.) Jens. on Wheat plants.]—*Nuovo G. bot. ital.*, N.S., xliii, 3, pp. 586–599, 1936.

When seed of the early wheat varieties Mentana and Gentil rosso mutico (*a*) from healthy plants, (*b*) from inflorescences inoculated with *Ustilago tritici*, (*c*) inoculated with *Tilletia tritici* [*T. caries*], and (*d*) with both fungi, were thickly sown in boxes in July, 1933, 92 per cent. of the resulting plants from the Mentana seed infected with *U. tritici* alone were affected with smut, 80 per cent. of those from the seed

inoculated with *T. caries* alone were bunted, and those from the seed infected with both fungi showed 92·5 per cent. with smut only, 1 per cent. bunt only, and 3·7 per cent. both diseases. The corresponding figures for Gentil rosso mutico were 98, 87, 97, 0, and 2 per cent. In the Mentana wheat the average height of the culms for the three types of infection was, respectively, 55, 54, and 46 cm., as compared with 68 cm. for the controls, the corresponding figures for Gentil rosso mutico being 70, 70, 64, and 85 cm.

These results were confirmed by further experiments later in the season, in which the seedlings were transplanted either close together or widely spaced. Only under the latter conditions did earing take place and the following additional data were obtained. The Mentana plants from the seed infected with *U. tritici* only showed 87 per cent. diseased plants and 74 per cent. diseased ears, while those from seed infected with *T. caries* only showed 82 per cent. diseased plants and 67 per cent. diseased ears, and those from seed infected with both fungi showed 85 per cent. plants with smut only, 6 per cent. with bunt only, and 3 per cent. with both diseases. The completely smutted Mentana plants averaged 2·4 culms, the completely bunted ones 3·4 culms, and those infected with both fungi and showing smutted ears 1·9 culms, those doubly infected and showing bunted ears having 3·2 culms, as against 5 culms in the healthy controls. Similar results were obtained with Gentil rosso mutico wheat.

It is concluded that in wheats parasitized by both fungi, the antagonism set up between the two parasites results in markedly heavier infection by *U. tritici* than by *T. caries* which is to a large extent suppressed, both when the plants are close together or widely spaced. When both infections were present on headed plants marked distortion of the culms resulted.

Lange de la Camp (Maria). **Gewinnung und Kultur der Haplonten von Ustilago tritici.** [The isolation and culture of haplonts of *Ustilago tritici*.]—*Phytopath. Z.*, ix, 5, pp. 455–477, 16 figs., 1936.

By exposing germinated spores of *Ustilago tritici* on 3 per cent. beer wort agar to temperatures of 2° to 4° C. for three or four days, the writer succeeded in inducing the separation of the four haploid cells of the promycelium, in such a way that each segment could be isolated and cultured independently. The reaction to sudden cold varies in intensity for the different strains and can be stimulated by increasing the concentration of the nutrient medium. An extraordinary degree of variability was observed among the haploid lines within a given group of approximately equal pathogenicity to the differential wheat varieties used at the Halle Plant Breeding Station [*R.A.M.*, xi, p. 774; xiv, p. 620], without any apparent correlation between growth type and virulence. Hyphal fusions, fusion bridges, and binuclear hyphae were detected in fixed and stained preparations of cell suspensions of different sexes, but were absent from those derived from a haploid line or two lines of the same sex. A simple macroscopic method of determining the sex of individual haplonts was found, based on the fact that colonies of different sex develop a light streak in the zone of contact, whereas this does not appear when the colonies are of the same sex.

The procedure adopted was to plant inoculum from the culture to be tested on potato dextrose agar in Petri dishes between transfers from known plus and minus strains. According to results so far obtained there is in *U. tritici* a simple bipolar sexuality. A morphological, secondary sex character was also observed within two strains.

VISSER (M. F.). **Warmwater-trommelontsmetter tegen stuifbrand.** [A hot water drum disinfection apparatus against loose smut.]—*Tijdschr. PlZiekt.*, xlii, 10, pp. 275–290, 1 pl., 1 fig., 3 diags., 1936.

The author describes in detail an apparatus for the hot water treatment of seed-grain against loose smuts, especially that of wheat [*Ustilago tritici*], which is stated to be greatly on the increase in Holland [see next abstract]. The machine consists essentially of a perforated drum capable of rotation by means of a handle in water raised to the desired temperature (53° C.) by steam generated in a separate boiler and introduced by a jet into the disinfection apparatus. For filling or removal of the seed-grain the drum is raised and run on to a stand with a small waggon below it into which the material can be emptied. The apparatus is designed for a capacity of 1 or 2 hectol. and the time taken for treating each charge is 15 mins. (including 5 minutes for recharging).

OORT (A. J. P.). **Problemen bij de bestrijding van de brandziekten der granen.** [Problems in the control of cereal smuts.]—*Tijdschr. PlZiekt.*, xlii, 11, pp. 291–302, 2 diags., 1936. [English summary.]

Some of the problems involved in the control of cereal smuts in Holland are discussed, with special reference to the loose smuts of wheat (*Ustilago tritici*) [see preceding abstract] and barley (*U. nuda*). The number of fields rejected for seed certification purposes of recent years on account of these diseases has been extraordinarily high; in 1935, for instance, 100 per cent. of the Prins Leopold and 83 per cent. of the Vilmorin 27 wheat plots entered for inspection failed to reach the requisite standard, the corresponding figures for Prins Hendrik, Trifolium, and Robusta, however, being only 0, 4, and 5 per cent., respectively, indicating that the cultivation of resistant varieties is of primary importance. In order to minimize the losses consequent on the rejection of their stands for seed, growers are in the habit of excising the smutted heads prior to inspection, and the advisability of prohibiting this practice as conducive to the spread of infection is under consideration. The occurrence in Holland of physiologic forms of *U. nuda*, characterized by aberrant spore germination of the *U. hordei* type, was conclusively demonstrated in 1936.

BOCKMANN (H.). **Die Getreidefusskrankheiten.** [The cereal foot rots.]—*Forschungsdienst*, ii, 1, pp. 68–71, 1936.

The writer summarizes, with brief critical notes, some of the more important recent literature (from 1922 onwards) on the foot rots of cereals (chiefly *Ophiobolus graminis* and *Cercosporella herpotrichoides*) [*R.A.M.*, xvi, p. 29]. The bibliography comprises 31 titles.

LUDBROOK (W. V.). **Wojnowicia graminis (McAlp.) Sacc. and D. Sacc. in relation to foot rot of Wheat in Australia.**—*Bull. Coun. sci. industr. Res. Aust.* 103, 23 pp., 1936.

In studies conducted from 1933 to 1936 on *Wojnowicia graminis* [*R.A.M.*, xiv, p. 425], widely distributed in wheat-growing areas of Australia and frequently found on wheat plants suffering from foot rot, no important physiological differences were detected in culture between 85 isolates from wheat. The strains could be differentiated into three classes, one containing the majority of isolates and two comprising forms differing more from other groups than those of the same group. Pycnidia were rarely produced in culture except on oat agar. The optimum, maximum, and minimum growth temperatures on potato saccharose agar were 22°, 32°, and under 5° C., respectively. The optimum P_H value was about 7·5.

In parallel inoculation tests on wheat *W. graminis* was decidedly less pathogenic than *Ophiobolus graminis*, *Fusarium culmorum*, or *Helminthosporium sativum*, producing a superficial discoloration of the basal parts of plants grown in infected soil, but apparently exercising no ill effect on growth. Pathogenicity remained practically unaltered even by treatments of the inoculated plants designed to favour attack. No difference in pathogenicity was observed in 50 isolations of the fungus. Concurrent infection with *Urocystis tritici* or *Tilletia tritici* [*T. caries*] did not significantly increase the susceptibility of wheat to *W. graminis*, and the presence of the last-named in the soil did not increase susceptibility to the other two organisms or to *F. culmorum*. The fungus was isolated from 12 species of artificially inoculated grasses and cereals but it was not found more pathogenic to these than to wheat. No appreciable difference in susceptibility was shown by 100 wheat varieties, nor did infection reduce yield.

Under the conditions of the experiments *W. graminis* was only very slightly, if at all, pathogenic to wheat. No evidence was obtained that it is of economic importance in Australia.

SPRAGUE (R.). **Relative susceptibility of certain species of Gramineae to Cercosporella herpotrichoides.**—*J. agric. Res.*, liii, 9, pp. 659–670, 1936.

The author states that during seven years of intensive search in the United States *Cercosporella herpotrichoides* [*R.A.M.*, xvi, p. 30] was only collected on the following wild grasses growing in or at the edge of winter wheat fields severely infected with the fungus, namely, *Agropyron inerme*, *A. riparium*, *Koeleria cristata*, *Bromus tectorum*, *B. inermis*, *B. marginatus*, and *Sitanion hystrix*; typical *Cercosporella* lesions were also observed on *Poa secunda* Presl., but the organism could not be isolated from this host. A tabulated account is given of field and greenhouse experiments, the results of which showed that while under optimum conditions for infection a number of genera and species of grasses were moderately susceptible to *C. herpotrichoides* (species of *Agropyron* being the most susceptible of all the grasses tested), under the semi-arid conditions that prevail in the open these grasses do not become heavily infected with foot rot. There was also evidence that

certain late-maturing varieties of cereals, e.g., Wilhelmina wheat, which appeared to be resistant in the field, did not in reality contain genetic factors for resistance but only escaped infection through their lateness in maturing. Considerable differences in reaction to the fungus were observed in various species of *Aegilops* and *Triticum*, some being markedly resistant and some highly susceptible, indicating the possibility of eventually developing resistant varieties from hybrids between wheat and certain related wild grasses. Evidence is also adduced, indicating that *C. herpotrichoides* has been present for a long time on native grasses in the Columbia basin.

Pronitcheva (Mme L. L.). Фузариоз Пшеницы в Азово-Черноморском крае в **1934** г. и оценка его вредоносности. [Fusariosis of Wheat and determination of its injuriousness in the Azoff-Black Sea region in 1934.]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 129–137, 1936. [English summary.]

The author states that in 1934, evidently owing to exceptionally dry conditions during the spring, wheat crops in the Azoff-Black Sea region suffered heavily from foot rot in the seedling stage; isolations showed 61·7 per cent. of the infection to be due to species of *Fusarium* and 32·5 per cent. to *Helminthosporium sativum*; later the plants suffered from attacks of *Fusarium* spp. on the haulms. The species of *Fusarium* isolated included *F. herbarum*, *F. orthoceras*, *F. scirpi* var. *acuminatum*, and *F. sporotrichioides*; although *F. graminearum* (*Gibberella saubinetii*) [*R.A.M.*, xv, p. 789] was not isolated in pure culture, its abundant occurrence in the region in 1933 makes it highly probable that it was also present in 1934. It was further shown that heavy attacks on the fertile stems reduced the yield in grain by 72·8 to 76·2 per cent., and the specific gravity of the grain by 42·0 to 49·2 per cent. Artificial inoculation of wheat ears with *G. saubinetii* during blossoming reduced the yield by 77·9 per cent. and the specific gravity by 72·4 per cent., while inoculation ten days after the end of blossoming resulted in 43·7 per cent. reduction in yield and 50·9 per cent. reduction in specific gravity.

Special experiments indicated that the intensity of attack by *Fusarium* spp. was significantly reduced by extra early (12th March) sowing of spring wheats, crop rotation, and spring ploughing to a depth of 20 cm. after removal of the turf.

Gorlenko (M. V.). Об источниках инфекции яровых Пшениц бактериозом колосьев. [On the sources of infection of spring Wheats with bacteriosis of the ears.]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 109–114, 1936.

The author established, by preliminary field counts in the Ukraine, that wheat plants (with two to four stems) affected with bacteriosis (*Bacterium translucens* var. *undulosum*) [*R.A.M.*, xvi, p. 91] have from 96 to 100 per cent. of the ears actually infected with the organism. This fact indicates that infection of the plant is systemic and further evidence for this was afforded by experiments in which plants grown from grain collected from diseased Caesium 0111 wheat showed 91·9 per cent. ear infection, as against 35·5 per cent. in plants grown from healthy

seed of the same variety; 46·2 per cent. infection occurred in plants grown from healthy seed on soil to which chaff from diseased grain was added. The presence of the disease in plants raised from healthy seed indicates that secondary infection from neighbouring plants is also extant, but the chief source of infection is undoubtedly the seed from diseased plants. Control measures should, therefore, be directed towards finding an effective means for the disinfection of the seed-grain, and also towards the development of resistant varieties. The possibility of infection being carried in the soil, as indicated by the tests with infected chaff, should also be taken into consideration.

McMillan (J. R. A.). **'Firing'—a heritable character of Wheat.**—*J. Coun. sci. industr. Res. Aust.*, ix, 4, pp. 283–294, 2 pl. [facing p. 316], 1936.

A description is given of an abnormal character of wheat designated 'firing' in which the uppermost laminae begin to die as a whole about flowering time. Death is fairly rapid, but the laminae retain their shape and stiffness for some days. They turn greenish-grey to dull brownish-red, and then to the ordinary straw colour. The sheaths die later, changing immediately to straw colour, and the stems and ears later still. Affected plants usually produce small, stunted ears, flower late, and give shrivelled, viable seed, though some bear no ears. The condition appeared to be due to physiological breakdown, and predisposition to it was found to be inherited. The genetics of the inheritance of the abnormality are discussed.

Jones (G. H.). **Control of Barley diseases. 2. Loose smut and leaf stripe.**—*Bull. Minist. Agric. Egypt*, 167, 21 pp., 11 pl., 1 fig., 2 graphs, 1936.

Barley loose smut (*Ustilago nuda*) is rare on the common native varieties in Egypt, and leaf stripe (*Helminthosporium gramineum*) does not generally cause much loss, but the new varieties originating at Giza have proved more or less susceptible to both diseases. In each case the practical problem of control resolves itself into completely freeing the new varieties from infection without exposing them to germination injury, since very little air-borne infection occurs. Experiments with variations of Jensen's hot water treatment showed that with 4 hours' pre-soak loose smut control increased steadily with duration and temperature of the water (3, 5, and 10 minutes at 50°, 51°, and 52° C.) until complete control resulted with 10 minutes' treatment at 52°. No injury was caused to germination. Leaf stripe was more sensitive to control by heat, complete freedom from infection resulting both from 10 minutes' treatment at 50° and 5 minutes' at 52°. The results obtained were, however, irregular compared with those in the loose smut experiments, the interfering factor probably being secondary infection carried to the treated from the untreated, adjacent plots. Seed treatments were then carried out with a specially designed, small, continuous action, automatic machine [full details of which are given]. This consisted essentially of a circulating water-pervious cloth belt with beaded edges running on the upper course through two slit brass tubes, which guide the belt through a

thermostatically controlled tank; the seed is delivered into the belt which closes at the top to form a tube of 7 in. circumference, the seed at the centre being only 1·1 in. away from the hot water. The temperature of the tank does not vary more than ½° C. and the speed of the belt can be adjusted by altering the size of the driving pulleys. The operator has merely to keep the feed hopper filled with pre-soaked grain and remove the treated seed for drying in the sun. Complete freedom from loose smut without injury to germination resulted from a 4-hour pre-soak in cold water followed by 7½ minutes' treatment at 56° minimum working temperature, the heat cut-off being arranged at 56·5°. Complete control of wheat loose smut (*U. tritici*) [see above p. 241] without injury to germination was given by identical treatment with the bath at 58°.

Murphy (H. C.) & Levine (M. N.). **A race of crown rust to which the Victoria Oat variety is susceptible.**—*Phytopathology*, xxvi, 11, pp. 1087–1089, 1936.

The physiologic form of crown rust of oats (*Puccinia coronata avenae*) [*P. lolii*] from Texas, to which the Victoria variety (resistant to 37 strains of the fungus) is susceptible [*R.A.M.*, xv, p. 571], is herein designated as No. 41. In reaction tests with the new form on 11 standard differential varieties plus Victoria and Bond at approximately 70° F., Bond and Glabrota remained entirely immune and Ruakura was only mildly attacked, while all the others were more or less severely infected. Bond is known to be susceptible only to forms 33 and 34 of *P. lolii*, additional forms of which will probably be judged solely on the basis of their reaction to this variety and Victoria; these two varieties were therefore included in the test, even though the 41 races may be identified by using the 11 standard varieties only. Under present conditions, for every known parasitic race of rust or smut attacking oats, an immune variety has also been recognized, and as long as this situation continues the outlook for breeding for resistance may be considered promising.

Kotte (W.). **Pflanzenschutz im Maisbau.** [Plant protection in Maize cultivation.]—*Kranke Pflanze*, xiii, 11, pp. 193–196, 1 pl., 1936.

Maize smut (*Ustilago zeae*) is stated to be practically co-extensive with the cultivation of the crop in south Germany [*R.A.M.*, xii, p. 88], but it may be effectively combated by strict observance of the following simple measures: crop rotation, avoidance of fresh stable manure and sparing use of liquid manure, and rigorous elimination of the first smut balls, which should be burnt or deeply buried.

Hoppe (P. E.). **Intraspecific and interspecific aversion in Diplodia.**—*J. agric. Res.*, liii, 9, pp. 671–680, 2 figs., 1936.

The author states that in the course of his cultural studies of *Diplodia zeae* [*R.A.M.*, xv, p. 793] he observed phenomena of aversion [cf. ibid., xiv, p. 645], manifested most frequently by an antagonistic reaction between adjacent colonies, in which growth at the advancing margins

ceased and was apparently followed by a dying-back of the mycelia, resulting in a darkening of the agar between the colonies. In other cases, however, the advancing hyphae of the different colonies intermingled freely, with a piling up or 'drifting' of the mycelium at the line of juncture. It is believed that aversion in *D. zeae* results from the interaction between two physiologically different strains, the number of which is apparently very large, since 21 strains were obtained from 25 cultures isolated from as many ears of maize from one field, and 25 isolates from widely separated points throughout the maize belt of the United States gave 24 different strains. The particular aversion reactions of the strains which were studied remained stable, after successive mycelial propagations, through three successive pycnidial generations in pure culture, and also through inoculation into maize cobs and subsequent reisolation. Aversion also occurred between colonies of *D. zeae* and of *D. macrospora* [ibid., xiv, p. 564].

Field experiments in 1934 and 1935 at Madison, Wisconsin, in which plants of three inbred maize lines were inoculated with various combinations of three strains of *D. zeae* and a strain of *D. macrospora*, showed that usually one strain exerted an inhibitory effect on the others, so that it alone was re-isolated from ears inoculated with a mixture; there was evidence of a definite sequence in the inhibitory powers of strains upon one another and, so far as tried, *D. zeae* predominated over *D. macrospora*.

TAKASUGI (H.) & AKAISHI (Y.). **Studies on the downy mildew of Millet in Manchukuo (second report). About the infection power of oospores.**—*Res. Bull. S. Manchuria Rly Co.* 15, pp. 13–57, 3 pl., 5 graphs, 1935. [Received December, 1936. Japanese, with English summary.]

The oospores of downy mildew (*Sclerospora graminicola*) of Italian millet [*Setaria italica*] in Manchukuo were first detected on the infected organs some 80 days after sowing the crop [*R.A.M.*, xiv, p. 577]. Inoculation experiments with the oospores gave 40 to 100 per cent. positive results. When these bodies were sprinkled with water and maintained at a temperature of 31° C., the growth rate of the germ-tubes exceeded 500 μ in five days.

In a test to determine the infective capacity of the oospores in soil at varying distances from the seeds, no infection developed beyond 5 cm. when both were on the same level, while the corresponding limits when the oospores were above or below the seeds were 8 and 4 cm., respectively.

When kept in a dry state the viability of the oospores persisted for eight years. Experiments on the germinative and infective capacities of the oospores after overwintering under various conditions showed an inverse relationship between soil depth and virulence. Cultural factors predisposing the crop to infection by *S. graminicola* included thickness of the soil layers covering the seed and omission of potash and phosphoric acid from the fertilizer scheme. Of the 83 varieties of *Setaria italica* tested for their reaction to downy mildew, 19 proved comparatively resistant. Among the more effective methods of seed treatment was immersion in formalin.

WANG (C. S.). **Viability and longevity of chlamydospores of Ustilago crameri.**—*Phytopathology*, xxvi, 11, pp. 1086–1087, 1936.

Chlamydospores of *Ustilago crameri* (the agent of millet [*Setaria italica*] smut [*R.A.M.*, xvi, p. 159]) were taken from sori of various ages from emergence to maturity of the host and tested for germinability in water and a 2 per cent. sugar solution. A considerable number germinated without any resting period, physiological maturity evidently being reached before morphological completion. A fairly high percentage of spores stored at 7° to 9°, 16° to 20°, and 20° to 25° C. maintained their viability for three years in the writer's tests, while about 1 per cent. of material from Rabenhorst's Fungi Europaei Cent. xix, published 1874, was also found to be germinable. Actually this collection appears to date from 1872, so that a period of viability of 64 years for the chlamydospores of *U. crameri* is indicated.

SAWADA (K.). **Studies on the development and propagation of Phoma citricarpa McAlpine.**—Reprinted from *J. Formosan Agric., 1935*, 7–8, 31 pp., 1 pl., 1 fig., 1935. [Japanese. Abs. in *Jap. J. Bot.*, viii, 3, p. (77), 1936.]

In the author's pure cultures of *Phoma citricarpa*, the agent of a yellowish to dark brownish, concave spotting of growing or stored oranges [*R.A.M.*, xv, p. 281] in Japan, the conidia were observed to be furnished with a white mucilage facilitating their adhesion to the fruit. They failed to germinate either in distilled, tap, or sugar water, but did so in orange juice and citric (0·1 to 0·3 per cent.) or tartaric acids. Sporulation in *P. citricarpa* occurs most freely at about 25° C. Wounds inflicted on the surface of the fruit by the insect *Rhynchocoris humeralis* appear to constitute the principal channels of entry of the fungus.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas. (Fortsetzung.)** [Coffee pests and diseases in Africa. (Continuation).]—*Tropenpflanzer*, xxxix, 11, pp. 455–481, 17 figs., 1936.

In this continuation of the writer's survey of coffee pests and diseases in Africa [*R.A.M.*, xv, p. 798] brief notes are given on diseases caused by *Colletotrichum coffeanum*, *Cercospora coffeicola*, *Trachysphaera fructigena* [ibid., xiv, p. 154], koleroga disease [*Corticium koleroga*: loc. cit.], *Botrytis* rot of coffee cherries [ibid., x, p. 297], and coffee cherry fall [ibid., xiii, p. 114].

ANDREWS (F. W.). **Investigations on black-arm disease of Cotton under field conditions. I. The relation of the incidence and spread of black-arm disease of Cotton to cultural conditions and rainfall in the Anglo-Egyptian Sudan.**—*Emp. J. exp. Agric.*, iv, 16, pp. 344–356, 1 fig., 6 graphs, 1936.

Detailed observations on the incidence and spread of blackarm (*Pseudomonas* [*Bacterium*] *malvacearum*) in 51 native 10-acre plots in the Gezira area of the Sudan in 1932–3 [*R.A.M.*, xiii, p. 696] showed

that most infection occurred in the earliest sown crop. Out of 19 selected plots 14 showed most infection on the side nearest the old cotton land, and 5 an irregular distribution of infection probably due to the scattering of wind-blown infective debris on the new land before sowing [ibid., xvi, p. 173]. Most of the outbreaks (the first symptoms of which became apparent 12 to 14 days after initial infection) were associated with rainfall on particular dates. It was found that rate of spread depends on the frequency and severity of the rains.

Observations on 16 plots in 1933–4 in a badly infected area gave striking evidence of decrease in infection with increasingly late sowing, there being an evident relationship between the amount of infection and diminishing rainfall. Apparently, the cotyledons and leaves first become susceptible when the plants are about 11 and not under 9 days old. A correlation was also noted between rapid increase in incidence and the occurrence of driving rains. Out of 15 plots adjacent to the previous year's cotton land, 10 showed initial infection on the side nearest the old land, and in only one of these did the earliest sowing occur on that side.

It is concluded that infective debris on adjacent cotton land of the previous season is the main cause of an outbreak of blackarm in the new crop and when this source of infection is present sowing date is a major factor governing the earliness of an outbreak. The severity and frequency of driving rains are also an important factor in determining the final severity of the disease. The only effective means of control is to remove or render innocuous infective material remaining on old land.

TENNYSON (GERTRUDE). **Invasion of Cotton seed by Bacterium malvacearum.**—*Phytopathology*, xxvi, 11, pp. 1083–1084, 1 fig., 1936.

Under favourable conditions of moisture 20 per cent. or more of cotton seedlings become infected with *Bacterium malvacearum* [see preceding and next abstracts] as a result of internal contamination of the seed. Evidence is briefly adduced from laboratory tests to show that the organism can enter untreated and delinted cotton seed through the basal cap in the presence of water. The cap is composed of pigment-bearing cells with large intercellular spaces and sections of inoculated seed showed the bacteria beneath the basal cap and in the spaces. Under natural conditions innumerable bacteria are washed to the ground from the infected foliage and remain suspended in the run-off water between the rows of cotton, where they can maintain their viability for 44 to 56 hours [*R.A.M.*, xv, p. 214]. The seed of open bolls soaked in bacterium-laden water has been experimentally shown to carry both internal and external contamination. On entering the mature seed the organisms apparently become inactive and remain so until germination commences. The basal cap, adhering to the cotyledons, is carried upwards as the plant emerges from the soil. The soil water may convey the bacteria to the seed leaves and hypocotyl, or they may be washed by rain or dew on to the leaves and stems, thus inducing primary seedling infection.

Meissakhovitch (J. A.) & Medvedeff (I. D.). Механизация протравливания семян Хлопчатника формалином. [Mechanization of Cotton seed disinfection with formalin.]—*Mechanization of Plant Protection, Bull. Pl. Prot. Leningr., Ser. III (Control measures and implements), 1936*, 8, pp. 77–88, 2 figs., 1936.

A tabulated account is given of preliminary tests in 1935, the results of which showed that cotton seed disinfection by formalin [against blackarm (*Bacterium malvacearum*): *R.A.M.*, xvi, p. 172] can be satisfactorily and economically effected with Heid's cereal seed disinfecting apparatus, with some technical modifications in its construction. The seed is fed by a hopper into a tank containing formalin, from which it is raised by means of an Archimedean screw, rotating in a galvanized iron cylinder, inclined at an angle of 35°. The tests showed that three workers can disinfect up to 1,050 kg. cotton seed per hour with the help of this hand-driven apparatus, and that if the working of the machine could be made continuous its output could be brought up to 1,460 kg. seed per hour.

Sarejanni (J. A.) & Cortzas (C. B.). **La nature de la résistance du Coton au Macrophomina phaseoli (Maubl.) Ashby.** [The nature of the resistance of Cotton to *Macrophomina phaseoli* (Maubl.) Ashby.]—Reprinted from *C.R. IIIième Congr. int. Path. comp.*, 4 pp., 1936.

To ascertain whether the susceptibility of the Greek cotton variety 'Dodiotico' (*Gossypium herbaceum*) to *Macrophomina phaseoli* and the resistance of American varieties of the same fungus [*R.A.M.*, xv, p. 577] are due to different anatomical characters the authors made a histological examination of the tap-roots of pot seedlings of the different cottons grown in Greece. These showed that in Dodiotico cotton the cortical phelloderm of the tap-root consists of 5 to 8 layers of nearly square cells averaging 25 to 28 by 15 to 25 μ, while in the King, Acala, Trice, and Ingold varieties it consists of 8 to 12, 10 to 12, 10 to 15, and 22 layers, respectively, of rectangular cells measuring 50 to 72 by 25 to 30 μ. Further, the suberized membrane averaged 1·5, 2·5, and 4·5 μ thick in the Dodiotico, Acala, and King varieties, respectively.

The available evidence indicates that the fungus effects entry through cracks in the phelloderm. Observation showed that most infection occurs locally in argillaceous soils which crack during hot weather and cause injuries to the Dodiotico roots. The phelloderm of the American cottons being stronger, these are naturally less susceptible.

Taubenhaus (J. J.) & Christenson (L. D.). **Role of insects in the distribution of Cotton wilt caused by Fusarium vasinfectum.**—*J. agric. Res.*, liii, 9, pp. 703–712, 1 fig., 1936.

This is a full report [an abstract from which has already been noticed from another source: *R.A.M.*, xiii, p. 766] of the authors' experiments, in which a species of *Fusarium* similar to or identical with *F. vasinfectum* was obtained in pure culture from the faecal pellets of a number of phytophagous insects or their larvae (including *Alabama argillacea, Laphygma frugiperda, Prodenia ornithogalli*) which had been

fed in cages on wilt-infected cotton plant tissues. Successful inoculation of cotton seedlings was obtained with the strains of *Fusarium* thus recovered. Passage through wireworms, Collembola, and Japygidae, however, was fatal to the fungus.

The work established that the following insects act as natural carriers of *F. vasinfectum* in Texas, namely, *Melanoplus differentialis*, *M. mexicanus*, *M. femur-rubrum*, *Encoptolophus texensis*, *Spharagemon cristatum*, *Tomonotus aztecus*, *Chortophaga viridifasciata* var. *australior*, *Schistocerca americana*, *S. obscura*, *Trimerotropis citrina*, and *Dissosteira carolina*.

While it was shown that *F. vasinfectum* survived for 15 months in faecal pellets from grasshoppers kept dry in the laboratory, its passage through the alimentary tract of the insects studied is relatively rapid (not over 45 minutes), so that while swiftly flying insects could undoubtedly spread the fungus from field to field through their faecal pellets, the supply of fungus contained by them would be exhausted before they covered any great distance. The boll weevil (*Anthonomis grandis*), *Nezara viridula*, and other insects, however, were found to be capable of transporting viable spores of *F. vasinfectum* on the surface of their bodies, and this fact opens unlimited possibilities for the spread of cotton wilt.

PETCH (T.). **Cordyceps militaris and Isaria farinosa.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 216–224, 1936.

After referring to Tulasne's opinion, expressed in 1857, that *Isaria farinosa* was the conidial stage of *Cordyceps militaris* [*R.A.M.*, xv, p. 801], the author gives a short historical survey of the work done on this point by De Bary, G. F. Atkinson, and R. H. Pettit, and describes his own data from which he concludes that the conidial stage of *C. militaris* is a *Cephalosporium* occurring on the mycelium on the larva or pupa bearing the *Cordyceps*. It has not been known to produce an *Isaria* form in nature or culture. *I. farinosa* is a fasciculate *Spicaria*, and may occur as an *Isaria* or a simple *Spicaria*. No perithecial stage is known and it has no relation to *C. militaris*. Furthermore *C. militaris* attacks the larvae and pupae of Lepidoptera (the two records on Coleoptera are probably erroneous), whereas *I. farinosa* occurs on Lepidoptera, Hymenoptera, Coleoptera, Diptera, Aphides, and Arachnida. The *C. militaris* of the United States is the same as the European species.

FRESA (R.). **Enfermedades de la Langosta, Sporotrichum paranense March., Coccobacillus acridiorum d'Hér.** [Locust diseases, *Sporotrichum paranense* March., *Coccobacillus acridiorum* d'Hér.]—*Mem. Com. centr. Invest. Langosta 1934, Min. Agric. nac. B. Aires*, pp. 97–102, 2 pl., 2 graphs, 1936.

The green fungal parasite, *Sporotrichum paranense*, of Argentine locusts [*Schistocerca paranensis*: *R.A.M.*, xv, p. 216] was successfully cultured on a medium of wheat grains in flasks in a water bath at a temperature of 25° to 30° C., and field experiments were conducted in the dissemination of the fungus by (*a*) the establishment of infection foci and (*b*) spraying and dusting the insects. The former method gave

negative results, while the latter, though affording promising indications of practical utility, requires further extensive testing to determine its value on an agricultural scale. Fifty caged locusts kept for comparison in the above-mentioned tests died of a disease believed to have been due to *Coccobacillus acridiorum* [ibid., xiii, p. 439].

MOORE (M.) & DE ALMEIDA (F. P.). **New organisms of chromomycosis.** —*Ann. Mo. bot. Gdn*, xxiii, 4, pp. 543–552, 1 pl., 1936.

English and Latin diagnoses are given of the fungi causing chromomycosis in North and South America [*R.A.M.*, xv, p. 720; xvi, p. 38].

Phialophora macrospora n.sp. [loc. cit.] differs from *P. verrucosa* in its spores and spore-bearing 'cups'. The spores measure up to 7 μ in diameter when spherical, and 3 to 7 by 2 to 4 μ when ellipsoid, and the spore-bearing 'cups' are 2 to 7 (chiefly 4 to 5) μ in diameter at the lips. The oidioid cells are approximately 5 μ in diameter, and the spherical cells (on Loeffler's agar) 6 to 14 (usually 12) μ in diameter. The colonies are greyish-brown or olivaceous-green to black.

Botrytoides n.gen. simulates *Botrytis* morphologically, but differs in the blue-black colour of the culture. The repent, branched, septate hyphae are submerged on most media. The simple, branched or proliferating, brown conidiophores have simple, irregular tips due to small 'sterigmata', left after the conidia have fallen off. The fusiform to short-cylindric, brown or subhyaline conidia are borne close together at the tip of the conidiophore. The type species, *B. monophora* n.sp., forms dark, greenish-grey, or olivaceous-green to black colonies with a brown or purple tinge and single or multicellular, lateral or terminal conidiophores. The ovoid, ellipsoid, or subfusiform spores measure 2 to 8 by 1½ to 5 μ, and are arranged along the conidiophore or in head formation.

Hormodendroides n.gen. has a black, septate, branched mycelium with simple conidiophores bearing several fusiform to short-cylindric conidia attached to the terminal portion, or conidiophores of the *Hormodendrum* type with subspherical or ellipsoid spores, catenulate in acrogenous branches. *H. pedrosoi* [ibid., xvi, p. 99] is transferred to the genus as *Hormodendroides pedrosoi* (Brumpt) Moore & Almeida n.comb., and constitutes its type species.

Phialoconidiophora n.gen. differs from *Phialophora* by the presence of three types of conidiophores: (*a*) dendroid, branching conidiophores of the *Hormodendrum* type, with cupuliform spore-bearers at the apices or laterally, (*b*) of the *Botrytoides* type, and (*c*) cupuliform spore-bearers of the *Phialophora* type. Chlamydospores are present. Spores from the 'cups' are globoid to ovoid, hyaline to subhyaline, those from the *Botrytoides* type of conidiophores are ovoid, ellipsoid, or subfusiform, and those from the *Hormodendrum* type are subspherical or ovoid and catenulate in acrogenous branches.

In *Phialoconidiophora guggenheimia* n.sp. the cultures are olivaceous-green or greyish-black, tinged with purple or black. The hyphae bear conidia 3 to 8 by 1½ to 4½ μ, either sessile, single, and isolated or on conidiophores of the *Botrytoides* type. The conidiophores of the *Hormodendrum* type bear several phialides, approximately 4 to 10 by 2 to 4 μ, and conidia 3 to 8 by 1½ to 4½ μ. The phialae measure 2 to 6 μ

in diameter at the lips, and are borne on specialized branches or develop directly from hyphae or on stalks. The mostly hyaline spores measure 1 to 3 μ in diameter when globoid, and 2 to 4 by 1 to $2\frac{1}{2}$ μ when ovoid. The thick-walled, single or multilocular chlamydospores measure approximately 3 to 16 by 3 to 16 μ.

P. compactum n.comb., to which *H. compactum* [ibid., xv, p. 804] is transferred, has predominantly the *Hormodendrum* type of sporulation, rarely the *Phialophora* type. In the former, the subspherical, smooth, olivaceous conidia borne in short branching chains in compact groups at the tip of the conidiophores measure 2·5 to 4·8 by 2·5 to 3·8 μ. The conidiophores of the latter type measure 7 to 12 by 3 to 4 μ and the oval, smooth, thin-walled, light green conidia 2 to 3 by 1·5 to 2 μ.

Moore (M.). **Mycologic technique in dermatologic practice.**—*Arch. Derm. Syph., Chicago*, xxxiv, 4, pp. 880–886, 1936.

A description is given of an effective technique for use in routine laboratory work on cases of suspected mycosis. Scrapings from the lesions (preferably the borders) should be mounted in potassium or sodium hydroxide (10 to 30 per cent.). Stains (e.g., cotton blue) may be used to advantage on thin material, and India ink for the examination of specimens suspected of infection by blastomycosis or torulosis. The most widely used medium for the cultivation of human pathogenic fungi is a modification of Sabouraud's original formula consisting of 10 gm. peptone, 40 gm. dextrose, 15 gm. agar, and 1,000 c.c. tap or distilled water, with a P_H value of 5·2 to 5·6. If the organism is to be preserved for teaching or comparative purposes, it should be grown on the so-called 'conservation agar': 30 gm. peptone, 15 gm. agar, and 1,000 c.c. water, the omission of the carbohydrate from which precludes morphological changes. A very useful medium for yeast isolations consists of 12·75 gm. maltose, 15 gm. each malt extract and agar, 2·75 gm. dextrin, 2·35 gm. glycerine, 1 gm. each dipotassium phosphate and ammonium chloride, and 0·78 gm. peptone (P_H 4·7). For liquid media (used in drop cultures) the following are recommended: nutrient broth, liquid wort, Sabouraud's minus the agar, 2 per cent. peptone, and 2 per cent. peptone plus 2 per cent. dextrose.

Peyri (A.) & Casanovas (M.). **Observaciones sobre dos casos excepcionales de favus.** [Observations on two uncommon cases of favus.] —*Rev. méd. Barcelona*, xxv, 147, pp. 266–268, 2 figs., 1936.

Clinical details are given of two cases of favus due to *Achorion schoenleini*, one in a 28-year-old male and the other in a female infant, to which a certain interest attaches by reason of the unusual site involved in the former and of the extremely early age (six days) of the patient in the latter.

Milian [G.] & Karachentzeff. **Epidémie de trichophytie epidermique due au 'Microsporon felineum' chez 10 personnes. Extension au cuir chevelu chez deux enfants.** [An epidemic of epidermal trichophytosis due to *Microsporon felineum* among 10 persons, with extension to the scalp in two children.]—*Bull. Soc. franç. Derm. Syph., 1936 (II)*, 5, pp. 1621–1622, 1936.

Details are given of ten cases of epidermomycosis in females of neigh-

bouring families ranging from 6 to 82 years of age, with extension to the scalp in the case of the two children involved. Cultures from the squamae and hairs consistently yielded *Microsporon felineum* [*R.A.M.*, xv, p. 721; xvi, p. 101], accompanied in a few instances by *Penicillium*, *Trichothecium roseum* [ibid., x. p. 731], and *Haplographium de bellae marengoi* [ibid., xv, p. 220].

OBRTEL (J.). **Výsledky mykologického vyšetřování na české kožní klinice v Praze v r. 1934.** [The results of mycological studies at the Czech Skin Clinic in Prague in 1934.]—*Čes. Derm.*, xvi, 4, pp. 104–110, 1 pl., 1936. [Abs. in *Zbl. Bakt.*, Abt. 1 (*Ref.*), cxxiv, 5–6, p. 133, 1936.]

Of the 50 cases of skin disease of fungal origin (confirmed by culture) investigated at the Prague Skin Clinic in 1934, 11 were due to *Microsporon audouini* [*R.A.M.*, xv, p. 721], 3 to *Trichophyton violaceum* [ibid., xvi, p. 179], 10 to *T. gypseum asteroides* [*T. mentagrophytes*: ibid., xvi, p. 101], 5 to *Achorion schoenleini*, 2 to *A. violaceum* [ibid., xv, p. 151], 4 to *Monilia* [*Candida*], 7 to *Epidermophyton inguinale* [*E. floccosum*: ibid., xv, p. 580], 5 to *E.* [*T.*] *interdigitale* [ibid., xvi, p. 178] and 3 to *T. rubrum*. The last-named made the most interesting study, causing a typical disorder to which the name of 'eczema serpiginosum epidermophyticum' is applied [ibid., xv, p. 438].

HOWLES (J. K.). **Infectious intertrigo.**—*Amer. J. trop. Med.*, xvi, 1, pp. 77–90, 3 graphs, 1936.

Ten per cent. of the 600 cultures examined mycologically from scrapings of infectious intertrigo in a survey of nearly 3,000 cases among adult males in an American prison yielded pathogenic fungi in the following proportions: *Epidermophyton* [*Trichophyton*] *interdigitale* [see preceding abstract] 32, *E. inguinale* [*E. floccosum*: loc. cit.] 17, *E.* [*T.*] *rubrum* [loc. cit.] 4, *E.* [*T.*] *gypseum* [*R.A.M.*, xvi, p. 179] 3, and unclassified 4. Attention is drawn to the extreme variability of the clinical manifestations induced by these dermatophytes, corresponding to their pleomorphism in culture. Some details are given of the therapeutic measures adopted against the condition.

LAWLESS (T. K.). **Tinea sycosis of the upper lip.**—*Arch. Derm. Syph., Chicago*, xxxiv, 1, pp. 118–121, 3 figs., 1936.

From the upper lip of a 50-year-old man the writer isolated a fungus characterized in pure culture on maltose agar by a smooth, round central cupula with radiations resembling the spokes of a wheel and alternating thick and thin, centrifugal zones, of which the outermost was fine, smooth, and lace-like, the remainder of the growth being coarse and pale yellow. Pluriseptate spindles and aleuriospores were observed. On the basis of these features the organism was identified as *Trichophyton gypseum* [see preceding abstract].

FISHER (VIRGINIA). **Diseases of the mouth due to fungi.**—*J. Amer. dent Ass.*, xxiii, 9, pp. 1665–1671, 1936.

This is a concise survey of some outstanding contributions to the knowledge of fungal diseases of the mouth, including thrush, perlèche,

and glossitis associated with *Monilia* [*Candida*] *albicans* [*R.A.M.*, xvi, p. 178], sporotrichosis (*Sporotrichum schenckii*) [ibid., xv, p. 361], stated to be particularly widespread in the Mississippi Valley, blastomycosis (*Blastomyces* [*Endomyces*] *dermatitidis*) [ibid., xvi, p. 100], and coccidioidal granuloma (*Coccidioides immitis*) [ibid., xv, p. 503].

Berghausen (O.). **Moniliosis of the respiratory and digestive tracts.**—*Amer. J. digest. Dis.*, iii, 4, pp. 271–272, 1936.

Clinical particulars are given of three cases of mycotic infection involving the respiratory and digestive tracts, of which two were shown by pure culture studies to be due to *Monilia* [*Candida*] *albicans* [see preceding abstract] and the third to *Torula histolytica* [*Torulopsis neoformans* or *Cryptococcus hominis*: *R.A.M.*, xv, p. 802], the last-named entering the system through an injury to the tongue.

Oyama (T.). **Kasuistischer Beitrag zur Sporotrichose.** [An etiological contribution to sporotrichosis.]—*Hihu-to-Hitunyo, Hukuoka*, iv, pp. 140–148, 1936. [Abs. in *Zbl. Bakt.*, Abt. 1 (*Ref.*), cxxiv, 5–6, pp. 139–140, 1936.]

Sporotrichum beurmanni [*R.A.M.*, xv, p. 482], isolated from the dorsal surface of the left hand and from the left forearm, made good growth both on Sabouraud's glucose and honey agars, forming ivory-coloured, later brown colonies with cerebroid convolutions in the centre; the brown pigmentation was absent on sugar-free media. Acid was evolved from a number of sugars, but no gas; gelatine was not liquefied; litmus milk was tinged faintly reddish. The fungus was pathogenic to mice and rabbits in laboratory experiments.

Brierley (P.) & McWhorter (F. P.). **A mosaic disease of Iris.**—*J. agric. Res.*, liii, 8, pp. 621–635, 4 figs., 1936.

This is a full account of the authors' studies of the mosaic disease of bulbous irises in the United States, a preliminary abstract of which has been noticed from another source [*R.A.M.*, xiii, p. 380]. The commercial importance of the disease which, as early as 1928, was widely distributed in Washington, Oregon, and California, lies chiefly in the dwarfing effect, resulting in a shorter flower stalk for cut blooms, and in a lower rate of increase in planting stock. Histological examination showed that in mosaic-affected leaves the epidermal cells are smaller than normal, and sometimes contain X bodies of a vacuolate or reticulate type [ibid., xi, p. 796]. In the flecked areas of flowers affected with mosaic the number of plastids is reduced. Of the aphids tested, only *Illinoia solanifolii* [*Macrosiphum gei*] and *Myzus persicae* were shown to be able to transmit the virus; three stocks of the first gave 32, 6, and 45 per cent. infection, and two stocks of the latter gave 76 and 31 per cent. infection, respectively. No transmission was effected by aphids transferred by means of a camel's hair brush, owing to injury to the mouth parts [ibid., xiii, p. 331]. Cross inoculations between different coloured varieties of the bulbous irises and between varieties of the Dutch and Spanish varieties (derived from *Iris xiphium* and *I. xiphium praecox*, respectively) were readily successful, and the disease was also transmitted to bulbous irises from naturally infected *I. ricardi*, *I.*

unguicularis var. *alba*, and from the bearded iris William Mohr. Consistently negative results were obtained in attempts to transmit the iris mosaic to tobacco, tomato, petunia, and tulip, and also to infect iris with mosaic from lily and tulip.

BURT (CATHERINE C.). **A leaf-spot disease of Sweet William caused by Heterosporium echinulatum.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 207–215, 3 figs., 1936.

On sweet william (*Dianthus barbatus*) leaves heavily infected with *Heterosporium echinulatum* received at the Scottish Plant Pathological Laboratory in May, 1932, the presence of small, black perithecia with mature asci was observed. Ascospores in hanging drop culture gave rise to typical *H. echinulatum* conidia and thereby established the relationship of the two stages. Single ascospores on malt extract agar formed a dome-shaped growth, white above and olive-green beneath, and produced the conidial stage in 4 to 5 weeks when the colony was about 1 to 1¼ in. in diameter. Single conidia isolated from the original mycelium gave rise to two types of culture, one of which (A) was exactly similar to that from single ascospores, while the other (B) differed in that the conidia developed in 4 to 10 days. When conidia of type A were produced the surface of the culture became greyish-green, whereas with type B it was olive-green. Conidia from the two types were repeatedly reisolated and replanted, but the distinction persisted on malt agar, though on sterilized carnation and sweet william leaves conidia were produced freely by both A and B types after 10 to 12 days. There was marked variation in size between conidia from different cultures on the same medium, and also between those on different media.

Conidia were placed on sterilized sweet william leaves on 6th December, 1932 and these, transferred to the greenhouse on 10th January, 1933, showed perithecia with asci in May, 1933. The black, irregularly spherical perithecia measure 100 to 270 μ in diameter and are provided with stout beaks, 10 to 30 μ long. Only about 10 per cent. contained asci, but under moist conditions many of the sterile ones developed tufts of conidiophores from the beaks, the conidia exactly resembling those of *H. echinulatum*. Each fertile perithecium contained 8 to 18 fascicled, thin-walled, hyaline, very irregularly shaped asci attached by short pedicels to a basal mass of pseudoparenchyma. Paraphyses were absent. The apex of the ascus was thickened up to 10 μ. Most of the asci contained 8 torpedo-shaped, thin-walled, colourless ascospores measuring 22 to 31 by 7 to 9 μ unequally divided by a transverse septum into an upper cell 1 to 6 (average 3·3) μ long, and a longer, narrower basal cell, with a slight constriction at the septum. The perfect stage is named *Didymellina dianthi* n.sp., with a Latin diagnosis.

In artificial infection experiments sweet william plants were highly susceptible, and pinks and carnations (well-known hosts of the fungus) very resistant, indicating that specialized races of the fungus are present on different hosts.

FIKRY (A.). **Diseases of Phlox and Antirrhinum.**—*Leafl. Minist. Agric. Egypt*, 76, 6 pp., 5 pl. [2 col.], 1936.

Phlox in Egypt is attacked by powdery mildew (*Erysiphe cichora-*

cearum) and leaf spot (*Septoria phlogis*) [*R.A.M.*, xv, p. 25]. The former spreads rapidly in humid weather, and causes a yellowing and falling of the leaves. The latter appears as small brownish spots which may enlarge and coalesce. Heavy infection of mildew may generally be avoided by late sowing, and against both diseases dusting with sulphur every fortnight, or spraying with bouisol are recommended.

Antirrhinum [*majus*] wilt (*Fusarium solani* var. *martii*) kills off both seedlings and mature plants, and is destructive in plants grown in the same beds for many successive years. Mature plants may either wilt suddenly or turn yellow and then wilt, or they may die prematurely without wilting. Control consists in the use of resistant varieties (e.g., Queen Victoria White, Intermediate Yellow, Coral Red and White, Very Dark Crimson, and Rose Suffused Salmon).

In a mimeographed addendum it is stated that a very severe outbreak of antirrhinum rust (*Puccinia antirrhini*) [ibid., xv, p. 655] occurred in Egypt in 1936.

RIKER (REGINA S.). **Fusarium lateritium v. fructigenum in relation to wilt of China Aster.**—*Phytopathology*, xxvi, 11, pp. 1085–1086, 1936.

A culture of *Fusarium lateritium* var. *fructigenum* [*F. lateritium*] from Germany, identified by H. W. Wollenweber and numbered 4221, was inoculated into China asters (*Callistephus chinensis*) in Wisconsin with positive results in 1930 and 1932 [*R.A.M.*, xv, p. 24], the varieties resistant and susceptible, respectively, to *F. conglutinans* var. *callistephi* [ibid., xv, p. 808] behaving similarly in respect of the German organism. Recent examinations by W. C. Snyder and Wollenweber of cultures of 4221 both in the United States and in Germany indicate that the original strain from the latter country was a mixture of *F. lateritium* and *F. conglutinans* var. *callistephi*, of which the latter was probably responsible for the symptoms of *C. chinensis* induced by inoculation with 4221.

DODGE (B. O.). **Marigold wilt.**—*J. N.Y. bot. Gdn*, xxxvii, 441, pp. 211–214, 2 figs., 1936.

An undetermined species of *Fusarium* with flesh-coloured conidia is suspected to be the agent of a wilt of African marigolds (*Tagetes erecta*) and certain dwarf types (*T. patula* and *T. signata pumila*) at the New York Botanical Garden, a *Verticillium* at the base of dying plants being apparently secondary. In general, the symptoms of the affected marigolds resemble those of asters [*Callistephus chinensis*] suffering from wilt [*F. conglutinans* var. *callistephi*: see preceding abstract], but it is not yet certain that the causal organisms are identical. The marigold *Fusarium* overwinters in the soil, sterilization of which should, therefore, be effected by the incorporation with the thoroughly pulverized soil of ½ gall. 1 in 50 formaldehyde per sq. ft. or by modifications of this treatment to suit individual environments.

ARK (P. A.) & GARDNER (M. W.). **Bacterial leaf spot of Primula.**—*Phytopathology*, xxvi, 11, pp. 1050–1055, 1 fig., 1936.

Phytomonas primulae n.sp., the agent of a leaf disease of *Primula*,

especially *P. polyantha* Mill. [*P. elatior* Hill], in the San Francisco Bay region of California, manifested by irregularly circular, brown, yellow-bordered lesions, up to 8 mm. in diameter, sometimes coalescing, is a motile, uniflagellate rod, 1 to 3·16 by 0·51 to 0·73 μ, staining readily with carbol fuchsin, methylene blue, and gentian violet, but Gram-negative. It is a facultative anaerobe, forming neither spores nor capsules, producing on beef-peptone agar smooth, round, glistening colonies, with a greenish pigment on this and other media. Gelatine is liquefied, milk coagulated, and ammonia is produced but neither indol nor hydrogen sulphide; nitrates are not reduced and no diastatic action is exerted on starch. Acid is evolved without gas from dextrose, lactose, sucrose, maltose, galactose, arabinose, glycerine, dulcite, and mannitol. The minimum, optimum, and maximum growth temperatures are 10°, 19° to 22°, and 34° C., respectively. The bacterium is very sensitive to desiccation, surviving only one hour's drying. Inoculations of healthy plants by atomizing with a suspension of the organism resulted in the development of conspicuous lesions in two to four weeks on the leaves only. Twenty-one of the 27 species of *Primula* inoculated proved susceptible, but *P. japonica*, *P. littoniana*, *P. microdonta*, *P. rosea* var. *grandiflora*, *P. sibirica*, and *P. viali* reacted negatively to infection.

Nicolas (G.). **Observations sur Puccinia mirabilissima Peck. Sa présence dans la région toulousaine.** [Observations on *Puccinia mirabilissima* Peck. Its presence in the neighbourhood of Toulouse.] —*Bull. Soc. mycol. Fr.*, lii, 2, pp. 239–248, 1936.

In June, 1935, and February, 1936, the author observed uredospores and teleutospores of *Puccinia mirabilissima* [*Cumminsiella sanguinea*: *R.A.M.*, xv, p. 372] on the leaves of *Mahonia* [*Berberis*] *aquifolium* near Toulouse. The fungus differs from *Uropyxis* in the fact that the aecidia are surrounded by a peridium of the *Puccinia* type and from the *Raveneliae* [including *Cumminsiella*] in its isolated, free teleutospores. It has all the characters of a *Puccinia* except that according to Magnus it shows the presence of two or more germinative pores in each cell of the teleutospore.

Preti (G.). **Un' infezione di 'Pythium' su piante di 'Phyllocactus phyllanthoides'.** [A *Pythium* infection on *Phyllocactus phyllanthoides* plants.]—*Riv. Pat. veg.*, xxvi, 9–10, pp. 331–353, 13 figs., 1936.

In July, 1936, *Phyllocactus phyllanthoides* plants growing in a cold greenhouse in Italy became affected by a wilt which was rapidly fatal to seedlings and caused plants over one year old to wither slowly or remain stunted and valueless. Brown, elongated spots were present at the collar, which was markedly constricted, and later spread outwards and upwards. A species of *Pythium* was constantly present in diseased material, sometimes in association with a *Fusarium* resembling *F. dianthi* [*R.A.M.*, xvi, p. 183]. The mature conidia measured 8·7 μ in diameter, and were provided with a germ-tube 2 μ in diameter.

Inoculations made by spraying a conidial suspension of the *Pythium* on healthy *P. phyllanthoides* in pots under glass at 26° to 27° C. were successful in nine days. Zoosporangia formed measuring 40·6 μ in

diameter, and containing 7 to 8 oval zoospores, 14·5 μ in diameter, and provided with peritrichiate cilia. Inoculations with a zoospore suspension on *P. phyllanthoides* plants of various ages under cool greenhouse conditions gave positive results only on very young plants, occasionally when sprayed, invariably when wounded.

In advanced infections pale yellow oogonia, 28 to 29 μ in diameter, were formed, with an epispore 2·9 μ thick, and provided with one, or exceptionally two, clavate antheridia. Oospore germination was not observed. The fungus is regarded as a new species and is named *Pythium cactacearum* [with a Latin diagnosis].

Control consists in the destruction of infected material, and improved ventilation of the greenhouse. Slightly affected plants may recover, but in severe cases a fresh crop should be sown in disinfected seed-beds. A preventive application of 0·5 per cent. copper sulphate and lime spray may be made to seedlings.

Tyson (J.). **Snowmould injury to Bent Grasses.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xix, 2, pp. 87–92, 7 figs., 1936.

Investigations during the winter of 1935–6 on the relative susceptibility to snow mould [*Calonectria graminicola*] injury of various bent [*Agrostis*] grasses in experimental turf plots resulted in the following rating (in decreasing order of resistance): (1) Astoria Colonial, (2) Washington and Metropolitan creeping, (3) Rhode Island and Prince Edward Island Colonial, (4) German mixed, and (5) Seaside creeping [*R.A.M.*, xv, p. 706]. Very severe infection by the fungus occurred on plots treated continuously with organic nitrogenous fertilizers, ammonium sulphate, urea, sodium nitrate, and especially calcium nitrate being much less injurious in this respect. The most economical of the very effective mercurial preparations tested against snow mould were mercuric chloride, calomel [mercurous chloride], mixtures of these two compounds, and red mercuric oxide [cf. ibid., xvi, p. 57], applied at rates of 2 to 4 oz. per 1,000 sq. ft., preferably mixed with dry, screened soil and broadcast over the turf.

Klinkowski (M.). **Die Luzerne als Objekt der Pflanzenpathologie.** [Lucerne as an object of phytopathological study.]—*Forschungsdienst*, ii, 9, pp. 457–474, 1936.

This is a concise summary of the outstanding literature published during the last six years on the insect pests and fungal, bacterial, virus, and physiological diseases of lucerne. A bibliography of 332 titles is appended.

Toovey (F. W.), Waterston (J. M.), & Brooks (F. T.). **Observations on the black-stem disease of Lucerne in Britain.**—*Ann. appl. Biol.*, xxiii, 4, pp. 705–717, 1 pl., 4 figs., 1936.

An account is given of investigations at Cambridge of the black stem disease of lucerne [*R.A.M.*, xvi, p. 184], which was recorded for the first time in Great Britain in the spring of 1934, and has since been found to occur in several other counties, while a similar disease of lucerne has also been observed in Wales. The causal fungus isolated from the lesions was shown in pure culture to be *Ascochyta imperfecta*

[ibid., ix, p. 274], the spores of which are extremely variable in size (3·7 to 15·0 by 1·7 to 4·2 μ) and in the percentage of uniseptate spores in the pycnidia; some collections and cultures only contained unicellular spores. The fungus was compared with cultures of *Phoma medicaginis* obtained from North America, with which it entirely agreed in all cultural and other details, and the second binomial is therefore considered to be a synonym of *A. imperfecta*, a conclusion which is supported by the fact that the British and the North American fungi both produced identical types of lesions in simultaneous inoculation experiments. Examination of type specimens of *Diplodina medicaginis* Oud. from Holland showed that this fungus is also synonymous with *A. imperfecta*.

Under experimental conditions *A. imperfecta* was also able to infect *Medicago lupulina* and *Trifolium pratense*, but has not been found on these hosts in the field. The disease may result in serious loss of lucerne herbage, but can be held in check by early cutting of the first crop each season.

Kozlowski (A.). **Soil conditions in relation to little leaf or rosette of fruit trees in California.**—*Phytopathology*, xxvi, 11, pp. 1041–1049, 1 graph, 1936.

In support of his contention, disputed by Chandler and Hoagland, that little leaf or rosette of fruit trees is due to the interaction of various fungal parasites (normally not very virulent) and adverse soil and climatic conditions [*R.A.M.*, xiv, p. 767], the writer resumes and enlarges upon the evidence already presented, which is further corroborated by tabulated chemical analyses of aqueous extracts from soils of affected orchards in California. The supposed curative effect of zinc sulphate applications is thought to be actually a result of improved soil conditions associated with colloid precipitation and a favourable adjustment of the hydrogen-ion concentration.

Davis (M. B.) & Blair (D. S.). **Cold storage problems with Apples.**—*Sci. Agric.*, xvii, 3, pp. 105–114, 1 fig., 1936. [French summary.]

A study at Ottawa of the behaviour of McIntosh and Fameuse apples in cold storage showed that loss from fungal rotting can be largely controlled by careful handling. Most cases of invasion occur at stem punctures, at bruises, or where the stems have been pulled out. Out of 1,752 cases of infection 61·87, 26·88, 8·56, 1·83, and 0·86 per cent. were caused by *Penicillium* spp., *Alternaria* spp., *Botrytis* spp., *Mucor* spp., and undetermined organisms, respectively. A study of temperature relationships showed that 2·03, 3·33, 6·35, and 10·79 per cent. of the rots occurred at 30°, 32°, 36°, and 40° F., respectively. Rots due to *Penicillium* spp. were less prevalent at the high than at the low temperatures. Those due to *Alternaria* spp. were greatly suppressed at the low temperatures, but at 40° were nearly as abundant as the *Penicillium* rots. The *Botrytis* infections developed much more readily under low than high temperatures. Decay due to *Mucor* spp. was confined almost entirely to the lots examined on the first and second sampling dates, i.e., 11th January and 4th March, 1935.

With McIntosh apples picked on 17th and 28th September, and 9th

October, 1934, and wrapped in oiled paper before storage, scald only developed after removal to a temperature of about 60°, when the average amounts [ibid., xv, p. 812] for all storage temperatures were, respectively, 17·33, 7·33, and 0 per cent., the corresponding figures for the Fameuse variety, picked on the same dates, being 31, 1, and 0 per cent. Immaturity at picking was obviously responsible for the scald development. The percentage amount of scald was significantly higher at storage temperatures of 30° and 32° than at either 36° or 40°.

In both Fameuse and McIntosh apples physiological breakdown (which causes by far the greatest loss in cold storage) takes the form of core-flush [ibid., xvi, p. 185]. In the latter variety a close correlation was observed between storage of immature fruits and premature core-flush development, particularly in storage at temperatures over 32°. Placing apples in storage when just at the climacteric appeared to induce rapid core-flush and immediate storage of fruit picked at the proper stage of maturity is recommended. The ideal temperature for the storage of Fameuse apples appears to be 32°, while 36° is satisfactory for McIntosh.

The results obtained with apples from different orchards and fertilizer plots indicated that nutrition does affect keeping quality, and tended to confirm the importance of the phosphorus-nitrogen ratio. Nitrogen applications to part of a Fameuse orchard under grass improved the keeping quality at 36° and 40° while similar applications to the mulch section brought about a significant deterioration in this respect. An application of nitrogen and phosphorus to the grass section (6 lb. nitrate of soda and 3 lb. superphosphate per tree) completely destroyed the keeping quality at the same temperatures, but on the mulch section improved it. In other plots under grass applications of 3 lb. nitrate of soda and 6 lb. slag per tree produced 100 per cent. core flush, a combination of 9 lb. and 6 lb., respectively, gave 12 per cent., and 3 lb. nitrate of soda alone 8 per cent. At Kentville, Nova Scotia, of two plots given nitrogen and acid phosphate over a period of twenty years, one plot receiving twice as much acid phosphate as the other, the plot given the smaller amount of phosphorus produced 6·3 per cent. breakdown, as against 22·1 per cent. in the other. Complete fertilizers (about 9–5–7) have produced better results than one or two element applications over a long period.

Gas storage experiments at Ottawa showed that McIntosh apples stored in 7½ per cent. carbon dioxide at 40° F. for about 2 months do not show scald upon removal from storage but fruit stored for longer periods is affected.

Young (L. C.) & Bailey (C. F.). **Progress report on the investigation of corky core of Apples.**—*Sci. Agric.*, xvii, 3, pp. 115–127, 2 figs., 1936. [French summary.]

In investigations carried out during 1934–5 in New Brunswick into apple corky core [*R.A.M.*, xvi, pp. 42, 186] promising control was given by combined magnesium sulphate and borax dry injections (9·6 and 0·5 gm., respectively), boric acid dry injections (0·8 and 0·7 gm.), boric acid wet injections [amount unspecified], borax dry injections (0·12 to 0·8 gm.), borax wet injections (1·5 to 2·1 gm.), and borax spray

(0·0125 per cent. boron). Magnesium and zinc failed to give control, and isolated failures occurred with boron though the effectiveness of this substance in controlling cork is clearly indicated. In all experiments the branch and not the tree was taken as the unit of experimentation and the results are fully tabulated.

The disease was observed in orchards with varying degrees of fertility and even in trees growing practically wild. Its intensity fluctuated from year to year. A study of root distribution indicated that in unaffected areas the larger roots tended to be concentrated at greater depths than they were in affected areas. There was a lack of correlation between the disease and plugging of the vascular ray cells [cf. ibid., xii, p. 453].

The boring of holes in the trees is regarded as undesirable, and spraying is a promising substitute method of applying the boron. Soil applications of borax at the rate of 4 lb. per 20-year-old tree did not injure the trees in seven weeks.

Atkinson (J. D.). **The control of corky-pit of Apples in New Zealand.**—*N.Z. J. Sci. Tech.*, xviii, 4, pp. 381–390, 5 figs., 1936.

Full details are given of the writer's continued experiments (on a larger scale than those previously reported) in the control of corky pit [or corky core] of apples in the Nelson district of New Zealand [*R.A.M.*, xiv, p. 592 and preceding abstract], where the disorder has been known since 1912, pears being also occasionally affected. Boron compounds were applied to the trees as follows: (1) Soil applications round the trunk, with or without digging in; (2) solutions injected into the soil round the tree by means of a lance and hand pump; and (3) injections at various strengths into the trunks. The soil treatments were carried out on six apple varieties, namely, Premier, Delicious, Washington, Jonathan, Sturmer, and Granny Smith, using borax and boric acid at the rates of ¼, ½, 1, 2, and 4 lb. per tree (6 and 8 lb. also in the case of Granny Smith). Both materials were injected at rates of 2, 4, 8, and 16 gm. per tree.

Fourteen treated Premier, 3 Delicious, 26 Washington, and 14 Jonathan remained practically free from pitting, while three controls of each variety averaged 76, 74, 71, and 59 per cent., respectively, of diseased fruit. Only one of the 67 treated Sturmers developed more than 8 per cent. pitting, the remainder being for all practical purposes sound, while the seven controls averaged 76·7 per cent. Similarly with Granny Smith, only one of the 82 treated trees developed more than 9 per cent. pitting and most were well below this figure, whereas the average percentage of the disease among the 16 checks was 87. Applied to the soil at the rates of 6 and 8 lb. per tree both borax and boric acid proved toxic, but no adverse effects followed the use of 4 lb. or less; injections of 8 and 16 gm. were also liable to cause damage, irrespective of the amount of solvent used.

Piper (C. S.). **The boron status of South Australian Apples.**—*J. Coun. sci. industr. Res. Aust.*, ix, 4, pp. 245–248, 1936.

The boron content of apples from various districts in South Australia was found to range from 12 to 30 parts per million of dry matter and

to show no relation to the incidence of bitter pit [*R.A.M.*, xv, p. 812] or McAlpine's confluent type of the disease.

BERWITH (C. E.). **Apple powdery mildew.**—*Phytopathology*, xxvi, 11, pp. 1071–1073, 1936.

A study was made of conidial germination and the inception of infection in *Podosphaera leucotricha*, the agent of powdery mildew of apple, under local conditions in California, where the disease is stated to be far more virulent than at corresponding latitudes remote from the Pacific coast [*R.A.M.*, ix, p. 547]. The optimum temperature for the germination of the conidia (which did not exceed 5 per cent. under the most favourable conditions) was found to lie between 19° and 22° C. [ibid., vi, p. 733]. High atmospheric humidity (approximating to 100 per cent.) was shown to be essential to germination, and under these conditions the infection of young apple leaves was accomplished in 45 to 48 hours at temperatures between 13° and 25°, conidiophores being produced in five days. The resistance of the foliage to infection increased rapidly with age after the first day following emergence, but was partially overcome by abrasion of the surface with carborundum. Attempts at ascospore germination were unsuccessful, but the mycelium, haustoria, and conidia were demonstrated in the deeper layers of the resting terminal and lateral buds completely invested by the fungus, which probably, therefore, survives the winter in the vegetative form [loc. cit.].

COOLEY (J. S.). **Sclerotium rolfsii as a disease of nursery Apple trees.**—*Phytopathology*, xxvi, 11, pp. 1081–1083, 1 fig., 1936.

Sclerotium rolfsii was readily isolated from the diseased roots of apple trees [*R.A.M.*, xii, p. 377] in a Maryland nursery in August, 1935, but similar experiments at a later date in the same season yielded few or no positive results, indicating that the fungus dies shortly after killing its host. Eighteen out of the 20 trees inoculated with sclerotia of the fungus in the following February were found to be extensively infected a month later, the causal organism being reisolated from the diseased tissues. The first sign of infection on nursery stock is a web of white mycelium on the tree at soil-level and on the surrounding soil, followed a few days later by the development on the same sites of sclerotia. By this time the bark is destroyed right round the collar, and the top soon becomes involved. The fungus does not advance far beyond the roots, but the stem may be invaded a short distance above soil-level. *S. rolfsii* appears to be more prevalent on relatively moist than on dry soils and may be responsible for appreciable losses—up to 5 per cent.—among nursery stock.

CHEAL (W. F.). **A note on the growth of the Apple scab fungus (Venturia inaequalis Aderh.) on Bramley's Seedling Apples during the winter 1934–1935.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 310–311, 1936.

In 1934 Bramley's Seedling apples stored out of doors in England

owing to the large crop showed unusually vigorous colonies of *Venturia inaequalis*. Detailed observations on 13 scab colonies on three apples showed that their average diameter increased from 5·076 mm. on 10th December, 1934, to 6·23 mm. on 13th February, 1935. This result confirms that obtained by Wormald with Bismarck apples [*R.A.M.*, xiv, p. 111], and emphasizes the importance of 'pin spot' scab at picking time.

PARKER (K. G.). **Fire blight: overwintering, dissemination, and control of the pathogene.**—*Mem. Cornell agric. Exp. Sta.* 193, 42 pp., 1 fig., 4 diags., 1936.

This is a comprehensive summary, based on the writer's experimental observations and on a study of the relevant literature, of the available knowledge on the overwintering, dissemination, and control of fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*] on apples and pears [*R.A.M.*, xii, p. 766; xvi, p. 157] in New York and California.

The exudate for the inoculation of the first spring blossoms may be provided by small overwintering twig cankers, but in the average New York season this mode of infection does not appear to be common. Usually blight infections are traceable to the larger overwintering cankers within the orchard, but in one instance the primary attacks on the blossom were apparently caused by inoculum carried in from outside the block under observation. The bacteria may be conveyed to the blossoms by splashing rain if the hold-over cankers are situated in the upper part of the tree, or through the visits of certain flies [ibid., xv, p. 589], e.g., *Bibio albipennis* and *Cynomyia cadaverina*, and possibly ants (*Formica fusca* var. *subsericea*), though the experimental evidence is too scanty to justify any definite conclusion as to the importance of this mode of transmission. In the case of secondary infection, however, blossom-visiting insects, including bees, are probably a more prolific source of inoculum than rain. Sucking insects of various kinds appear to be of considerable importance in the primary and secondary inoculation of terminal shoots, in which rain may also be a factor, while both agencies are involved in the infection of leaves, the water entering through natural apertures or wounds.

An appreciable reduction both in the incidence of fireblight and in the downward spread of infection was effected by the introduction into Bartlett and Clapp's Favorite pear and Ben Davis apple blossoms, either before, after, or simultaneously with *B. amylovorus*, of certain bacteria found by Thomas and Ark [ibid., xiv, p. 702] to be antagonistic to the fireblight pathogen. This line of attack is believed to merit further consideration, whereas the common practice of canker excision, besides being tedious and laborious, results in the loss of large amounts of bearing wood. Treatment of the cankers with relatively strong solutions of zinc chloride [ibid., xvi, p. 45] is effectual but apt to destroy unduly large areas of the living bark. In the writer's experiments cadmium sulphate solutions at concentrations of 15 per cent. and upwards proved toxic to the cankers without seriously injuring the sound tissues, while some degree of promise was also shown by aluminium sulphate and cadmium bromide.

Smith (M. A.). **Infection studies with Sclerotinia fructicola on brushed and nonbrushed Peaches.**—*Phytopathology*, xxvi, 11, pp. 1056–1060, 2 figs., 1936.

It has been suggested that the common practice of brushing peaches to remove the pubescence liable to harbour dirt, spray residue, and other foreign substances may increase facilities for fungal infection, and experiments were accordingly conducted at the Missouri Agricultural Experiment Station to determine the relative susceptibility to brown rot (*Sclerotinia fructicola*) [*R.A.M.*, xvi, p. 108, and next abstract] of brushed and unbrushed fruit of the Elberta variety.

Infection of the unbrushed surfaces was found to occur mainly by way of the hair sockets after a minimum period of 8 hours, the corresponding time for brushed fruit, which was penetrated chiefly through broken hair sockets, being 4½ hours. In neither lot were stomatal or direct infections common. It is evident from the outcome of these tests that the greater rapidity of infection in the brushed peaches was correlated with the enhanced accessibility of the treated surfaces to the germinating conidia of the fungus.

Hienton (T. E.) & Fawcett (K. I.). **The precooling of fresh fruit.**—*Agric. Engng, St. Joseph, Mich.*, xvii, 9, pp. 377–378, 382, 5 figs., 1936.

Technical details are given of various types of equipment in actual or prospective use in the United States for the precooling of fresh fruit and vegetables to eliminate the risk of mould development in transit, with special reference to *Rhizopus nigricans* on strawberries [*R.A.M.*, xiii, p. 176] and peaches [ibid., xii, p. 378] and to brown rot [*Sclerotinia fructicola*] of the latter [see preceding abstract]. One of the factors affecting the temperature in the cars is the amount of salt used on the ice, the maximum limit for strawberries being about 800 lb. Peaches should be packed either in crates or in well-ventilated baskets to ensure adequate circulation of air round the fruit.

Foëx (E.) & Lansade (M.). **Une maladie du Bananier.** [A Banana disease.]—*Rev. Bot. appl.*, xvi, 183, pp. 887–892, 1936.

Most of the information in this paper on a disease of Masri bananas (*Musa cavendishii*) in Syria associated with *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* and four bacteria has already been noticed from another source [*R.A.M.*, xv, p. 732]. In an addendum to the paper it is stated that as a result of the energetic measures pursued by the Government (comprising removal of diseased plants and disinfection of the holes), the disease has entirely disappeared.

Vogt (E.). **Die chemischen Pflanzenschutzmittel. Ihre Anwendung und Wirkung. Zweite, neubearbeitete Auflage.** [Chemical plant protectives. Their application and effect. Second revised edition.] —117 pp., 15 figs., Berlin and Leipzig, Sammlung Göschen No. 923, W. de Gruyter & Co., 1936. RM 1.62.

The revised edition of this useful compendium, first published in 1926 [*R.A.M.*, vi, p. 496], gives information on the standard plant protectives authorized by the German Plant Protection Service.

KOENIG (P.). **Bodendämpfung für Landwirtschaft und Gartenbaubetrieb.** [Soil steaming for agriculture and horticulture.]—*Tech. in d. Landw.*, xvii, 8, pp. 223–225, 4 figs., 1936.

An account is given of the technical and practical sides of the writer's experiments in the introduction into Germany of steam sterilization of the soil on American lines. Promising indications of the value of the method in combating diseases as well as in the improvement of the soil have already been obtained at the Reich Tobacco Research Institute, Forchheim, near Karlsruhe, using steam columns [cf. *R.A.M.*, xvi, p. 124] supplied by the firm of Kyffhäuserhütte (Artern).

GALLWITZ (K.). **3. Reichsnährstands-Ausstellung Frankfurt a. M. 1936. Technik der Schädlingsbekämpfung.** [Third Reich Food Board Exhibition at Frankfurt-am-Main, 1936. The technique of pest control.]—*Tech. in d. Landw.*, xvii, 8, pp. 161–162, 1 fig., 2 diags., 1936.

Particulars are given of the construction and application of two improved motor spraying machines (Gebr. Holder, Metzingen and H. C. Fricke, Bielefeld), a knapsack equipment, 'Matex' (C. Platz, Ludwigshafen), and the soil-steaming apparatus supplied by the Kyffhäuserhütte, Artern [see preceding abstract], all displayed at the third exhibition of the Reich Food Board at Frankfurt-am-Main in 1936.

PUSHIN (F.). Опрыскиватели. [Sprayers.]—*Mechanization of Plant Protection, Bull. Pl. Prot., Leningr., Ser. III (Control measures and implements), 1936*, 8, pp. 7–24, 8 figs., 1936.

A tabulated account is given of comparative working tests which were carried out in 1935 in the Crimea of German, American, and Russian power spraying apparatus under orchard, vineyard, and field conditions. The best practical results are stated to have been obtained with the tractor-driven apparatus 'X' constructed by OMVIZR [Mechanization Section of the Pan-Soviet Institute for Plant Protection] works, which was shown to be able to spray 1,700 apple trees (5 to 40 years old, growing close together in rows 8 to 10 m. apart) in an 8-hour working day, with a spray output of 30 l. per minute, and only required two men to work it. Next in all-round efficiency came the horse-driven 'Pioneer' sprayer of the 'Vulcan' Works, with a working capacity of 1,300 trees per day, and a tractor-driven sprayer of the same works with a working capacity of 2,280 trees per day. The tests showed the presence in the Russian sprayers of a number of structural and other defects, which were reported to the respective works, with suggestions for their elimination. While not wholly adapted structurally to the conditions in the Crimea, the American sprayers, such as 'Friend' and 'Bin' [?Bean] [*R.A.M.*, viii, p. 658; xi, p. 385], are outstanding by the simplicity of their construction, the resistance to wear and tear of the pump plungers, and their ease in movement, features which should be embodied, as far as possible, in the Russian apparatus.

While none of the apparatus tested was entirely satisfactory for work in the local open vineyards, the 'Pioneer' sprayer appeared to be the most suitable, and modifications are suggested for its improvement.

YATZENKO (I. P.). Опыливатели. [Dusters.]—*Mechanization of Plant Protection, Bull. Pl. Prot. Leningr., Ser. III* (*Control measures and implements*), *1936*, 8, pp. 33–76, 7 figs., 5 diags., 1936.

The results of working tests in various parts of the U.S.S.R. of a number of Russian and foreign dusting appliances, both worked by mechanical and hand power, showed that all had some defects of sufficient practical importance under orchard, vineyard, or field conditions to preclude their use on a wide scale. The construction of each of the machines tested is discussed in some detail, with an indication of the points in which they failed to give satisfaction. On the basis of these findings a tractor-driven duster 'TN-3' was constructed in 1935 by the 'Vulcan' Works, and preliminary tests indicated that after certain improvements, which are discussed, this apparatus will be able to meet all the practical requirements for field work.

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1935.** [Bibliography of plant protection literature for the year 1935.]—Biol. Anst. (Reichsanst.) Berl., 352 pp., 1936.

This bibliography of German and foreign literature published during 1935 on various aspects of plant protection has been compiled on the usual lines [*R.A.M.*, xv, p. 241].

KIBI (M.). **On the varieties of Aspergillus oryzae employed in shoyu manufacture. Part I. Morphological differences.**—*J. agric. chem. Soc. Japan*, xii, 9, pp. 885–897, 4 pl., 1936. [Japanese, with English summary on pp. 130–131.]

Fifty-four strains of moulds were isolated from numerous samples of 'koji', the 'starter' in the manufacture of soy sauce, and shown by morphological and physiological investigations to belong to 28 varieties of *Aspergillus oryzae* [*R.A.M.*, x, p. 559], the chief distinguishing cultural characters of which are tabulated. The conidial diameters range from 3·5 to 10 μ and the corresponding stalk lengths from 0·2 to 2·2 mm.

YENKO (F. M.), BAENS (L.), & SERRANO (F. B.). **Effect of molds on Bakauan bark and tanning liquors.**—*Philipp. J. Sci.*, lx, 3, pp. 241–249, 3 pl., 1936.

During the transportation of bakauan (*Rhizophora* spp.) bark [used in the manufacture of tannin extract or cutch] from the mangrove swamps to the cutch factory in the Philippines the bark usually becomes infected with moulds. Isolations yielded only two species, however, namely, *Aspergillus niger* and *Penicillium glaucum*. The former disintegrated the cortical tissues but did not appear materially to affect the composition of the extract derived from the bark or to alter the colour of the manufactured leather. Bakauan extract containing 5 per cent. tannin is not subject to attack by *P. glaucum* and is only slightly affected by *A. niger*, while a tannin content of 2 per cent. is sufficient to delay the growth of the moulds. Microscopical observations and chemical analyses indicated that the latex tubes are the main objects of the fungal invasion, the involvement of the cell walls being relatively unimportant.

CHAZE (J.). **L'Ivraie enivrante et la culture pure de son endophyte.** [Darnel and the pure culture of its endophyte.]—*C.R. Acad. Sci., Paris*, cciii, 18, pp. 885–887, 1936.

On 50 per cent. of the caryopses of darnel (*Lolium temulentum*) freed from external mould contamination by six to eight hours' immersion in calcium hypochlorite and subsequently sown in a darnel concoction, the slender, septate, branched, hyaline, later brown hyphae of an endophyte [*R.A.M.*, xiv, p. 700], from which arthrospores were abstricted, developed in two to three days. Microscopic examination showed that the mycelium originated in the internal fungal layer.

MAGROU (J.). **Culture et inoculation du champignon symbiotique de l'Arum maculatum.** [Culture and inoculation of the symbiotic fungus of *Arum maculatum*.]—*C.R. Acad. Sci., Paris*, cciii, 18, pp. 887–888, 1936.

The development of the mycorrhizal endophyte of *Arum maculatum* in pure culture (soil decoction) [*R.A.M.*, xv, p. 243] being very limited, an attempt was made to reconstitute the symbiotic relationship by placing an aseptic *Arum* seedling in contact with the cultures enriched with agar, *A. italicum* being used in default of *A. maculatum*, the seeds of which failed to germinate. A typical mycorrhiza developed in three weeks, with long, rectilinear intercellular hyphae showing lamellar extensions, intracellular arbuscles of extreme complexity, and encysted, often bilobate vesicles. The presence of the last-named, similar to those from which the cultures were derived, is considered to prove that the development of the fungus, from root to root, described a closed cycle. This is believed to be the first recorded instance of the analysis and synthesis *in vitro* of a mycorrhiza involving an endophyte with arbuscles and vesicles.

MULLER (H. R. A.). **Mycorrhiza van Citrus.** [Citrus mycorrhiza.]—*Landbouw*, xii, 1, pp. 1–10, 2 figs., 1 diag., 1936. [English summary.]

This is a critical review of Reed's and Mlle Frémont's study in California on the cytology and physiology of citrus mycorrhiza [*R.A.M.*, xv, p. 90], certain aspects of which are disputed by the writer on the basis of personal observations [? in Java]. For instance, the process interpreted in the Californian investigations as intercellular digestion of the hyphae is regarded merely as a phenomenon of autolysis of these elements following their death from the disintegration of the feeding haustoria within the host cells. The alleged beneficial influence of the mycorrhiza on the host is also called in question: the endophyte not only deprives the plant of valuable nutritive substances but involves it in an expenditure of energy to restore the equilibrium. The author concurs in Masui's opinion (*Mem. Coll. Sci. Kyoto*, Ser. B, iii, p. 149, 1927) that the curtailment of the infested rootlets of woody plants [cf. *R.A.M.*, vi, pp. 306, 307] is a sequel to the withdrawal of the host's food reserves by the endophyte, denoting a parasitic association [ibid., xv, p. 673]. The comparison drawn by Reed and Mlle Frémont between the citrus and pine mycorrhiza, the former representing a very unstable and the latter a particularly constant association, is not

considered altogether apt, since the pine mycorrhiza are of the ecto-endotrophic type with a fungal layer enveloping the roots and assisting their assimilation of organic matter from the soil [ibid., xv, p. 737], while the citrus endophyte, as already pointed out, is dependent on the host for its own food supply. In conclusion, the fact that in properly manured soils citrus roots show well-developed intracellular mycorrhiza with active digestion of the arbuscles, while in poorly growing trees the development of the endophyte is of a predominantly intercellular, parasitic character, is regarded as a consequence rather than a cause of the differences in vigour of the host. A judicious manuring scheme appears to benefit both parties to the association, whereas in the absence of proper nutrients the host suffers more than the fungus.

Weindling (R.) & Emerson (O. H.). **The isolation of a toxic substance from the culture filtrate of Trichoderma.**—*Phytopathology*, xxvi, 11, pp. 1068–1070, 1936.

Details are given of the composition and properties of a crystalline constituent of the principle lethal to *Rhizoctonia* [*Corticium*] *solani* produced by a culture of *Trichoderma lignorum* [*R.A.M.*, xiv, p. 249; xv, p. 361], which can be isolated by extraction with chloroform in a separatory funnel. The solvent is conveniently used in three portions, each equal to 0·1 of the volume of the filtrate. After distilling the chloroform from the extract, the residue is taken up in a small amount of hot benzene or 95 per cent. alcohol from which, on cooling, silky, white needles crystallize. The highest yields of the crystalline substance (70 mg. per l. of filtrate) were obtained from cultures of *T. lignorum* grown in a highly acid (P_H 3 to 4) medium with ammonium tartrate as the nitrogen source, and subjected to a strong aeration. This constituent is toxic to the hyphae of *C. solani* up to a dilution of 1 in 300,000 parts (about two-thirds the toxicity of mercuric chloride). A yellowish-brown gum obtained by evaporating the mother liquors to dryness exerted a maximum lethal effect equivalent to that of the crystals and inhibited hyphal growth at a dilution of up to 1 in 3,000,000. Both crystals and gum are also toxic to *T. lignorum* at a minimum concentration exceeding by some 40 times that required to kill *C. solani*.

The crystalline substance is a compound of carbon, hydrogen, nitrogen, sulphur, and oxygen, possibly represented by the formula $C_{14}H_{16}N_2S_2O_{41}$, with a melting point at 185° C.; it is moderately soluble in acetone and chloroform and slightly so in hot benzene, hot ethyl or methyl alcohol, cold alcohol and ether, and water, is strongly laevo-rotatory, and has a molecular weight of approximately 340.

Hill (H.). **Minor elements affecting agricultural crops.**—*Sci. Agric.*, xvii, 3, pp. 148–153, 7 figs., 1936. [French summary.]

In discussing the influence of boron, copper, manganese, and zinc upon plant growth, with special reference to the results obtained in experiments at Ottawa, the author states that when boron was applied in increasing amounts to turnips in sand cultures, all the roots in the untreated controls and the series given the smallest amount of boron (0·25 p.p.m.) were severely affected after ten weeks by brown heart

[see above, p. 225], whereas the condition became progressively less marked with increased applications of boron, and the series given the largest amount (1·5 p.p.m.) showed 20 per cent. entirely healthy roots, with only a slight amount of disease in the remainder.

Potatoes in sand cultures without boron [*R.A.M.*, xvi, p. 55] were extremely poor in vigour, the leaf margins being crinkled and often yellow or red, the yield greatly reduced, the quality poor, the tubers scurfy or badly russeted, and the flesh yellow after cooking.

Apple trees known to be affected by blotchy cork [cf., ibid., xv, p. 520 and above, p. 261], when grown in pots and fed with nutrient solutions containing boron at the rate of 1 p.p.m., recovered completely, while untreated trees continued to show the condition. When 1 gm. of boric acid was injected into the limbs of affected trees in Ontario only 60 per cent. of the fruits became affected, as against 94 per cent. in the case of the untreated limbs. Under orchard conditions cork and corky core were invariably associated with an alkaline or high lime condition of the soil.

The addition of manganous sulphate to soil of P_H 8 taken from an orchard in Ottawa in which apple trees had shown severe chlorosis and strawberries marked lack of vigour with slight yellowing of the foliage, at the rate of 0·004 gm. per 5 in. pot, resulted in healthy and vigorous growth of strawberry plants planted in the pots in comparison with others grown in the same soil without the addition of manganese. In sand cultures with potatoes the plants without manganese were stunted, the petioles shortened, and the foliage light green, the older leaves being yellow between the veins and conspicuously curled; the yield was much reduced, and the tubers were badly russeted, with enlarged lenticels.

Experiments with copper and zinc failed to give any indication that these elements are universally requisite for normal growth.

KÖHLER (E.). **Studien über den Verlauf des Kartoffelabbaus auf dem Dahlemer Versuchsfeld der Biologischen Reichsanstalt.** [Studies on the course of Potato degeneration on the Dahlem experimental plot of the National Biological Institute.]—*Landw. Jb.*, lxxxiii, 6, pp. 859–868, 1 diag., 1936.

The observations of Wartenberg and collaborators to the effect that potato tubers of healthy origin planted in the late summer yield sound (non-'degenerate') progeny even on the Dahlem experimental plots, where liability to the diseases comprised under the general heading of deterioration is extreme [*R.A.M.*, xiv, p. 387], were confirmed by the writer in tests on the Erdgold and Direktor Johanssen varieties in 1935. The Y virus was found to be present in the progeny of practically all the tubers planted in May, considerably less in evidence in those of the June plantings, and virtually absent from the offspring of the tubers set in August. The last-named were also free from the X virus, which occurred in the earlier plantings, though to a lesser extent than Y. *Myzus persicae* is responsible for the transmission of the Y virus, but apparently not the X form, with which some other insect active at midsummer is presumably concerned.

The transmission of the Y virus from potato to Samsun tobacco [ibid., xvi, p. 116] is less readily effected by means of tuber juice than

with that from the foliage, which no doubt contains a much higher proportion of the infective principle. The operation may be considerably simplified, however, by the abrasion of the tobacco plants with carborundum and the dilution of the tuber juice with water (1:1).

WARTENBERG (H.) & HEY (A.). **Das Redoxpotential des Gewebebreies der Kartoffelknolle. Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. III. Mitteilung.** [The oxidation-reduction potential of the pulped tissues of the Potato tuber. The electrometric determination of the seed value of the Potato tuber. Note III.]—*Planta*, xxv, 2, pp. 258–281, 1 graph, 1936.

Continuing their investigations on the electrometric determinations of the seed value of potato tubers in relation to 'degeneration' [*R.A.M.*, xv, p. 822, and preceding abstract], the writers describe an experimental study on the estimation of the oxidation reduction potential of pulped tissues. The application of the data obtained to the vitality of the material will be discussed in a forthcoming communication.

NEWTON (W.) & EDWARDS (H. I.). **Virus studies. I. The production of antisera in chickens by inoculation with Potato X.**—*Canad. J. Res.*, xiv, 11, pp. 412–414, 1936.

Chicken antiserum was produced by three wing vein injections of 1·5, 2, and 2 c.c., respectively, at three-day intervals with purified sap from *Datura meteloides* and *D. stramonium* infected with the potato virus X, the blood samples being drawn eight days after the last inoculation. The antiserum formed a conspicuous precipitate when incubated for three hours at 37° C. with similarly purified sap of the same hosts infected with the virus X (or healthy potato virus), but formed no precipitate when similarly incubated with purified sap from virus-free plants. Two tobacco ring spot viruses, one originally isolated from spinach and the other from tomato, were found by means of the precipitin reaction through the use of chicken antisera to belong to the X group, and though distinct from each other and from other strains of the X virus as judged by symptom expression on several hosts, they possessed similar lethal temperatures, longevities *in vitro*, and host ranges to those of the potato virus X.

METZGER (C. H.). **Curly dwarf in Colorado.**—*Amer. Potato J.*, xiii, 11, pp. 316–317, 1936.

Curly dwarf of potatoes [*R.A.M.*, xv, p. 460] was first observed in the San Luis Valley, Colorado, on an occasional Brown Beauty plant in 1933. In 1935, following a severe drought and psyllid [?*Paratrioza cockerelli*] infestation in 1934, the disease was sufficiently severe to cause the rejection of 80 per cent. of the Brown Beauty (the only variety affected) acreage entered for certification. It was observed that the lower leaves of otherwise healthy plants on either side of infected individuals showed symptoms of curly dwarf, while plants opposite diseased ones in adjacent rows were also affected. Core-graft tests are in progress to verify these observations, which suggest that the disorder is due to an insect-transmissible virus. Apart from extreme dwarfing

(the diseased plants seldom attain a height exceeding 12 in.) and curling of the leaflets, the symptoms of the Brown Beauty stands were identical with those described by Orton (*Bull. U.S. Dep. Agric.* 64, 1914) for curly dwarf.

Many of the tubers from curly dwarf hills show triangular lesions with the epidermis curling away from the shallow cavities thereby created. After a period in storage a shallow, sunken, hard, leathery black area develops on the skin surrounding the lesion and penetrates the tuber to a depth not exceeding $\frac{1}{8}$ in. Cultures of this tissue yielded only saprophytic organisms. In a few cases the entire flesh turned brownish-yellow during storage at room temperature from August to December, while all the eyes died on some of the tubers.

Eddins (A. H.). **Brown rot of Irish Potatoes and its control.**—*Bull. Fla agric. Exp. Sta.* 299, 44 pp., 6 figs., 2 graphs, 1936.

A full account is given of investigations carried out in Florida from 1929 to 1935 into brown rot or bacterial wilt (*Bacterium solanacearum*) [*R.A.M.*, xv, p. 459; xvi, p. 201] of potatoes and its control, the former name referring to the symptoms on the tubers only. The attack was so severe in the Hastings area in 1935 as to cause greater loss than that from all other potato diseases. Weather records from 1926 to 1935 inclusive showed that the rainfall was less, the mean temperature was higher, and the number of days when temperatures were favourable for brown rot (minimum 55°, maximum 77° F., or above) were greater in March 1935 than in March of any other year.

The disease occurs locally in all types of sandy soil, becoming less severe the longer the fields are cultivated. Samples of newly affected soils showed the P_H values to range from 4·32 to 5·42, compared with 4·42 to 6·2 for old land. The causal organism was killed in potato broth cultures acidified to P_H 4·02 and under, and on potato dextrose agar acidified to P_H 4·15 and under. It survived at P_H 8·71 when sodium hydroxide was used as the alkaline agent.

The disease was controlled experimentally by a single soil application of inoculated sulphur at rates ranging from 400 to 1,200 lb. per acre. Yields were decreased by the applications, but recovered as the soil adjusted itself to a more alkaline condition or when this was induced by the addition of calcium or dolomitic limestone one to three years after the sulphur treatment. The return to a normal P_H value was not accompanied by any return of the disease in two localities where the potatoes were grown in treated soil for 3 and 5 years, respectively. Inoculated sulphur at 800 lb. per acre induced P_H reactions lethal to the organism in the upper 8 in. of soil more rapidly when applied in June than in autumn or winter. Cowpeas used as green manure in 1935 significantly increased yield from 0·9 to 21·4 barrels per acre, but in 1934 the increase from 32·5 to 45·1 barrels is not regarded as significant. Hydrated lime (1,000 to 2,000 lb. per acre) gave some control of brown rot.

The common practice in the Hastings area of planting maize between rows of potatoes several weeks before digging was shown by an experiment in 1934 to increase infection by *Bact. solanacearum*. The planting operations were carried out three weeks prior to digging and resulted in injury to many potato roots with the consequent reduction in the

yield of healthy tubers of 21·2 barrels per acre. Elimination of the disease by crop rotation or weed eradication is regarded as quite impracticable owing to the number and nature of the hosts of *Bact. solanacearum*. A list of 60 hosts is given including four recorded as new, viz., *Solanum citrifolium*, *S. pyracanthum*, *S. sisymbrii*, and *Datura metel*.

In varietal susceptibility tests Green Mountain was the most resistant to brown rot of the tubers, followed in order by Katahdin, Bliss Triumph, Seedling 41914, Irish Cobbler, Spaulding Rose, and Chippewa. The percentages of plants wilted and killed was not a reliable criterion of varietal susceptibility, for some varieties had lower percentages of tuber infection and produced greater yields of healthy tubers than Spaulding Rose but showed approximately the same percentages of plant infection. Infected tubers continued to decay while in transit or when stored in the field.

Alcock (Mrs. N. L.) & Foister (C. E.). **A fungus disease of stored Potatoes.**—*Scot. J. Agric.*, xix, 3, pp. 252–257, 3 pl., 1936.

Of recent years stored potatoes in Scotland have been affected by a disease somewhat resembling the dry rot due to *Fusarium coeruleum* [*R.A.M.*, xiii, p. 649; xv, p. 705, *et passim*] and causing losses of up to 100 per cent. The first sign of infection usually consists of one or more shallow, circular depressions, $\frac{1}{16}$ in. in diameter, gradually enlarging to a size of 1 to 2 in. ('thumb marks') and assuming irregular oval or diamond-shaped forms. A somewhat reticulate wrinkling of the skin is common in the more advanced stages of the disease. The internal rotted areas measure from $\frac{1}{8}$ to 3 in. in diameter and do not always correspond exactly with the external lesions in size or depth. In the incipient phase of the disease the light brown, slightly watery, somewhat mealy tissues present an appearance identical with that due to *F. coeruleum*, but later the colour deepens to salmon-pink with a touch of grey and the tissues begin to shrivel, ultimately becoming dry and friable, dark greyish-pink to grey or even black. They are full of cavities lined with a septate, white to greyish-white mycelium bearing dark brown to black, carbonaceous, globoid or lenticular pycnidia, from which are extruded tendrils of hyaline, mostly non-septate, occasionally bi-, very rarely tricellular pycnospores. The intercellular mycelium is dark brown and profusely septate. The mycological and taxonomic aspects of the disease, the agent of which is an apparently undescribed representative of the Phomaceae, will be discussed elsewhere.

Inoculation experiments with cultures from single pycnospores on maize meal agar gave positive results without wounding on Arran Chief, Catriona, Di Vernon, Dunbar Cavalier, King Edward, and May Queen, while a number of others, including Doon Star (known to have been affected by a disease resembling the foregoing since 1927), contracted infection when inoculated over a bruise. The disease was also transmitted through cuts, and from infected to bruised tubers placed in contact, thereby confirming the view that the rot actually spreads in storage from a single focus of contamination. In a few instances the pycnidia have been found rupturing the skin of the tubers. The most susceptible varieties are Ally, Dunbar Cavalier, Catriona, Di Vernon,

Majestic, and Sharpe's Express; and generally speaking, the disease is most severe among the early sorts. Intensive cultural studies of 896 tubers showed that *F. coeruleum* and the *Phoma* dry rot were only present together in 90, so that the former is obviously not a necessary precursor of the latter.

CAIRNS (H.), GREEVES (T. N.), & MUSKETT (A. E.). **The control of common scab (Actinomyces scabies (Thaxt.) Güss.) of the Potato by tuber disinfection.**—*Ann. appl. Biol.*, xxiii, 4, pp. 718–742, 1936.

After summarizing the results obtained by previous workers on the control of common scab (*Actinomyces scabies*) of potatoes [*R.A.M.*, xvi, p. 121], the authors give a tabulated account of experiments which were carried out from 1932 to 1935, inclusive, in Northern Ireland. It was found that the disease is satisfactorily kept in check by the disinfection of seed-tubers before planting, provided a sufficient interval of time is allowed to elapse before the return of the potato crop to the same land. Under the six years' crop rotation scheme, which is normal in that region, satisfactory control was obtained in every case studied, and it is suggested that a four-year interval might possibly be sufficient. Still shorter intervals, however, are not considered safe, since they did not always afford good control of scab. No control was obtained from seed-tuber disinfection on land continuously grown to potatoes.

Among the fungicides tested, including mercuric chloride, formalin, copper sulphate, Burgundy mixture, and two proprietary mercury compounds A and B, the most satisfactory from the farmer's point of view were the last-named. In one preliminary experiment on fresh land, A at 0·5, 1·0, 1·5, and 3 per cent. gave 13·2, 8·7, 5·7, and 5·5 per cent. scabbed tubers (by weight), respectively, and B at corresponding strengths gave 17·6, 12·7, 8·6, and 7·8 per cent. compared with 6·9 for mercuric chloride (0·1 per cent., 90 mins. steep) and 49·9 for the untreated. In large scale field tests in 1935 on land free from potatoes for six years, treatment with A at 1·0 per cent. resulted in an average of 19·4 per cent. scabbed tubers, with B at 1·5 per cent. an average of 23·9 per cent., compared with 22·2 per cent. for mercuric chloride, and 76·4 per cent. for the untreated. The two mercurials were more effective as instantaneous dips ($\frac{1}{2}$ to 1 min.) than when used as 15 minute steeps at lower concentrations, and while B caused no growth depression at strengths up to 3 per cent., A was injurious at 2 per cent. Sometimes disinfection stimulated growth, but at other times a slight depression in growth was observed, which disappeared after 10 to 12 weeks. There was evidence that the planting of very slightly scabbed potatoes in land that had not been used for this crop for many years may result in a high incidence of the disease in the resulting plants.

DOROJKIN (N. A.). Итоги 7-летнего изучения порошистой парши Картофеля, **Spongospora subterranea (Wallr.) Johnson.** [Summary of seven years' investigations on powdery scab of Potato, *Spongospora subterranea* (Wallr.) Johnson.]—*ex* Порошистая Парша Картофеля [Powdery scab of Potato], pp. 5–38, 3 figs., 2 graphs, White Russian Acad. Sci., Inst. biol. Sci., Minsk, 1936.

The results of the investigations started in 1929 in White Russia

showed that powdery scab of potato (*Spongospora subterranea*) [*R.A.M.*, xvi, p. 118] may be of considerable economic importance, especially in years of heavy rains in May and June, and in moist soils, in which it may cause as much as 30 per cent. reduction in the crop, apart from losses due to increased liability of infected tubers to various storage rots, particularly late blight (*Phytophthora infestans*). The formation of wound cork below scab lesions on the tubers was only occasionally observed in White Russian material.

Researches in the U.S.S.R. have shown that the geographical distribution of powdery scab practically coincides with that of *P. infestans*, and that the former is prevalent and economically important in western Russia, as well as in the Azerbaijan and Armenian Soviet Republics in the Caucasus. It was established experimentally that infection of the crop may result both from infected seed-tubers and infected soil; in certain experiments, however, the crop raised from infected tubers planted in uninfected soil remained healthy, but a second crop from healthy tubers planted in the same plots was more heavily scabbed, demonstrating that diseased seed-tubers are very effective in introducing the powdery scab into new regions.

Confirmation was obtained of the efficacy of meranin [ibid., xiv, p. 330] in the control of powdery scab and of common scab [*Actinomyces scabies*]. Tests during seven years showed that while none of the commercial varieties used was immune from powdery scab, Jubel, Cobbler, and Parnassia may be considered as weakly susceptible, since these varieties were only occasionally infected. A series of artificial inoculations of wounded potato tubers with a heavy suspension of *S. subterranea* prepared from scab lesions triturated in distilled water showed that eight varieties of *Solanum* from South America were completely immune, as well as nine hybrids which were bred by the Pan-Soviet Institute for Plant Breeding.

The control measures recommended include compulsory crop rotation of not less than three years' duration, drainage of wet soils, disinfection of infected seed-tubers whenever complete rejection is not feasible, and the use of resistant varieties. Strict quarantine measures are also advocated for the prevention of the introduction of powdery scab into unaffected areas [ibid., xv, p. 400].

Rybakova (Mme S.) & Nedoshivina (H[elen]). К вопросу о порошистой парше. (Морфолого-биологические особенности возбудителя порошистой парши **Spongospora subterranea John.**). [On the problem of powdery scab. (Morphological and biological properties of the causal organism of powdery scab, *Spongospora subterranea* John.)]—*ex* Порошистая парша Картофеля [Powdery scab of Potato], pp. 57–85, 14 figs., White Russian Acad. Sci., Inst. biol. Sci., Minsk, 1936. [English summary.]

The authors give a brief historical, taxonomic, and morphological account of powdery scab of potato (*S. subterranea*) [see preceding and next abstracts], together with a discussion of its distribution in Western Europe, and in the U.S.S.R. Histological studies of material from White Russia showed that spore balls of *S. subterranea*, measuring 19 to 85·5 by 19 to 57 μ (average 47·8 by 40·5 μ), are present in the 10th to 15th

row of cells of the scab lesions, and plasmodia in different stages of development occur in the underlying cells. The invaded tissue consisted of crushed cells with half-destroyed or softened walls, containing very little or no starch at all. Wound cork underlying scab lesions was not found in White Russian material, but was occasionally seen in material from Georgia and North Ossetia [Transcaucasia], and from the Leningrad province. A description is also given of an aberrant form of powdery scab present in the Moscow region, which differs from that discussed above in that the spore balls are, as a rule, outside the host tissues, they are various tints of brown instead of yellowish green, have a plicate or irregularly crumpled surface, and may be agglomerated into a common damp mass; in size they vary from 94 to 134 by 20 to 25 μ, and their structure is not cellular. The host tissue did not show the presence of plasmodia, and wound cork is usual under the lesions. *S. subterranea* is generally considered to be restricted to Solanaceous plants, but N. A. Rojdestvenski is stated recently to have found specimens of *Ullucus tuberosus* of the Chenopodiaceae infected with it.

Kiyanovski (P. M.). Географические посевы Картофеля, зараженного порошистой паршой. [Geographical plantings of Potato infected with powdery scab.]—*ex* Порошистая парша Картофеля [Powdery scab of Potato], pp. 39–56, White Russian Acad. Sci., Inst. biol. Sci., Minsk, 1936.

Rovdo (A. S.). Географические посевы Картофеля, зараженного порошистой паршой, в БССР. [Geographical plantings of Potato infected with powdery scab in White Russia.]—*ex* ibid., pp. 87–110, 1936. [English summary.]

Details are given in these two papers of experiments carried out in 1935, in which potato seed-tubers infected with powdery scab (*Spongospora subterranea*) [see preceding abstracts], originating from White Russia and Armenia, were planted in various regions of the U.S.S.R., including areas where the disease has not yet been recorded, the second paper referring only to those carried out on the territory of the White Russia Soviet Republic. The results again confirmed the fact that the organism may be introduced into fresh ground with planting material; no infection developed, however, in regions such as those of Odessa, where the whole summer was exceptionally dry, and of Kieff, where no rain fell during the whole month of June. In Armenia, where the disease is prevalent, the infection in 1935 was slight, owing to dry weather conditions during the summer. The evidence collected indicated that powdery scab is directly dependent upon atmospheric precipitations and is co-extensive with late blight [*Phytophthora infestans*]. Control by soil drainage and by treatment of the seed-tubers with formalin (1 in 300 or 1 in 200) or meranin (1 in 2,000 or 1 in 1,000) is recommended.

Rippel (K.). **Über Begriff und Wesen der Bodenmüdigkeit.** [On the conception and nature of soil exhaustion.]—*Phytopath. Z.*, ix, 15, pp. 507–512, 1936.

A brief critical review is given of some outstanding recent contributions to the problem of 'soil exhaustion', the primary cause of which is

maintained to reside within the particular plant suffering from this condition. In connexion with a study at the Munich Technical College of the auxins of peas, the writer observed that *Saccharomyces cerevisiae* and a number of other *S.* spp. failed to multiply in a synthetic nutrient solution to which was added an aqueous extract of peas, the various moulds and other yeasts tested being unaffected. Good growth was made, however, in the filtrate of the pea extract shaken up with charcoal or boiled in sodium lye, both of which processes evidently eliminate the active principle. It was experimentally determined that a substance specifically inhibitory to the growth of *Saccharomyces* is contained in the roots, shoots, and cotyledons of peas, and it is suggested, on the basis of these tests, that the rapid exhaustion of soils by peas is due to the soil becoming permeated with secretions from the roots, especially dead ones, toxic to certain beneficial micro-organisms. A rational crop rotation would thus be the surest method of preserving agricultural soils in a state of biological and biochemical health.

Willis (L. G.). **Bibliography of references to the literature on the minor elements and their relation to the science of plant nutrition. Second edition.**—396 pp., Chilean Nitrate Educational Bureau, Inc., 120 Broadway, New York, 1936. [Mimeographed.]

The present edition of this valuable compendium of contemporary literature on various aspects (including phytopathological) of the relation between the minor elements [see above, p. 268] and plant nutrition contains some 3,000 references and abstracts, to which the compiler (soil chemist at the North Carolina Agricultural Experiment Station) proposes to add fresh material from time to time.

Summers (E. M.). **An investigation of types or strains of the mosaic virus of Sugar-Cane in Louisiana.**—*Iowa St. Coll. J. Sci.*, xi, 1, pp. 118–120, 1936.

A considerable body of evidence is available that more than four strains of the sugar-cane mosaic virus are present in Louisiana [*R.A.M.*, xvi, p. 125]. One virus source identified as strain 2 produced a new type of necrosis on the older leaves of infected Co. 281 canes. Another source, that had been regarded as strain 4, was used to inoculate Co. 281, and cuttings from this material subsequently showed about 40 per cent. germination recovery, though this had scarcely ever occurred in this variety before. An indication that yet another strain may be present was given by the appearance, in one field, of appreciable infection on C.P. 807, a variety long considered immune.

In 1925, P.O.J. 36–M, 213, and 234 showed 100 per cent. mosaic in most cane fields in Louisiana, but by 1930 the disease had almost entirely disappeared from all plantings of P.O.J. 213 and had become much less in those of the other two by a combination of 'foliage' and 'germination' recovery. A wave of secondary spread, starting in 1930 and becoming increasingly severe subsequently, has again brought infection in these varieties up to 100 per cent. At first, both types of recovery were common in P.O.J. 36–M, but no recovery has occurred in the newly infected P.O.J. 213 material.

Before the existence of different strains of the virus had been demon-

strated the differential rates of recovery observed in P.O.J. 36–M were attributed to a probable qualitative attenuation of the virus, while it was assumed that P.O.J. 213 had been infected with a virulent source directly from wild grasses, which had increased virulence. The discovery of the new strains, however, offered a more likely explanation of the problem, and evidence at present available indicates that strains of the virus are arising locally, possibly within the cane plant or by passage through other Graminaceous hosts.

Gumming disease.—*Aust. Sug. J.*, xxviii, 8, pp. 484–485, 1936.

Provision is reported to have been made by the Minister for Agriculture and Stock for the rigorous enforcement of the quarantine regulations against gumming disease of sugar-cane [*Bacterium vasculorum*] in Queensland [*R.A.M.*, xvi, p. 205]. Fresh outbreaks were observed in 1936 and any further extension of the infected area would necessitate the exclusion of the valuable S.J. 4 and Clark's Seedling canes from the entire district between Mossman and Mulgrave.

Mayor (E.). **Notes mycologiques. IX.** [Mycological notes. IX.]—*Bull. Soc. neuchâtel. Sci. nat.*, lxi, pp. 105–123, 1936.

In these studies on 36 fungi of the Neuchâtel canton [*R.A.M.*, xiii, p. 655], the following items are of special interest. *Erysiphe nitida* was found on all the green parts of *Delphinium cultorum*, besides occurring in the canton of Geneva on *D. grandiflorum*, a new host for the fungus in Switzerland. A species of *Oidium* was observed affecting *Antirrhinum majus*. *Cronartium asclepiadeum* [*Peridermium pini*: see below, p. 288] was found on trunks of *Pinus montana* both in Neuchâtel and Berne cantons, in each of which this host is a new record. In the latter locality the uredospores and teleutospores of the fungus were noted on *Vincetoxicum officinale*.

Of 22 species of *Allium* inoculated with *Melampsora allii-fragilis*, pycnidia and caeomata were readily obtained on *A. ascalonicum*, *A. cepa*, *A. fistulosum*, *A. porrum*, *A. schoenoprasum*, and 14 others, whereas *A. angulosum*, *A. paradoxum*, and *A. scorodoprasum* were entirely resistant. When similar inoculations with caeomata found in nature on *A. oleraceum* and *A. vineale* were inoculated into 17 species and varieties of *Salix*, all except *S. pentandra* and *S. alba* × *triandra* remained unaffected. The former developed numerous uredospores and teleutospores; the latter showed few uredospores, which disappeared after a short time.

Caeomata of *M. allii-salicis albae* were found on *A. vineale* and were shown experimentally to be associated with the uredospores and teleutospores of the fungus on *S. alba* and *S. vitellina*. Experimental evidence showed that all the infected willows belonged to the section with unicoloured bracts. In artificial infection tests in a glasshouse pycnidia and caeomata were obtained on the same species of *Allium* as were found susceptible to *M. allii-fragilis*, but *A. angulosum*, *A. parodoxum*, and *A. scorodoprasum* were again resistant.

Artificial inoculation of *Abies alba* in a glasshouse with the teleutospores of *Milesia kriegeriana* [ibid., xiii, p. 117; xv, p. 469] found on

Dryopteris filix-mas resulted in the production of white aecidia resembling those found in nature.

The aecidia of *M. polypodii* [loc. cit.], a fungus commonly present locally on the fronds of *Polypodium vulgare*, were noted on the year's needles of *Abies alba* (a new record for Switzerland) growing near *P. vulgare* heavily infected by the uredospores. Infection experiments [which are described] demonstrated conclusively that the fungus forms its aecidia on *A. alba*; these organs develop at the beginning of August and can be observed until November. The pycnidia, which are difficult to see and appear to be fugacious, occur near aecidia in process of formation. The aecidia develop only on the lower surface of the current year's needles. The globose, subglobose, or elongated aecidiospores measure 20 to 35 μ in diameter, and have a verrucose membrane approximately 1 μ thick. The peridia are well-developed, and seen in the flat appear to have polygonal cells with a verrucose membrane; seen from the side they have a smooth outer membrane 2 μ thick and a verrucose inner membrane 2 to 4 μ thick.

SYDOW [H.]. **Mycotheca germanica Fasc. LVII–LX (no. 2801–3000).**—*Ann. mycol., Berl.*, xxiv, 4–5, pp. 387–401, 1936.

Nineteen of the species included in the fascicles LVII to LX of the author's Mycotheca germanica are furnished with taxonomic commentaries. *Microthyriella rubi* [*R.A.M.*, xii, p. 788] occurs both on the leaves and tendrils of *Aristolochia sipho*, fructifications being formed, however, only on the latter organs for several years in succession, though they were observed on the foliage of *Mahonia* [*Berberis*] *aquifolium*. *Pseudopeziza meliloti* n.sp. ad int., found on *Melilotus alba* leaves in Westphalia, differs from the widespread *P. medicaginis* [ibid., x, p. 192; xii, p. 177; xiv, p. 424] and *P. trifolii* [ibid., xiv, p. 241] in its ovate or elliptical ascospores, tapering bluntly at both ends, 8 to 11 by 4 to 5 μ; another specimen is in the possession of the writer from the same host in Lithuania. *Coleophoma rhododendri* n.sp., occurring on wilting or moribund leaves of cultivated *Rhododendron* in Westphalia, differs from *Phyllosticta rhododendricola*, the agent of grey, brown-edged lesions on the same host, in its conidial dimensions (13 to 20 by 2 to 2·5 μ compared with 8 to 10 by 3 μ) and in the absence of any apparent spotting of the foliage. *Colletotrichum idaeinum* is the agent of an apparently serious disease of raspberry runners, on which it produces conspicuous vesicular, rapidly crumbling spots. *Pseudodiscosia* [*Heteropatella*] *antirrhini* [ibid., ix, p. 247], hitherto recorded only on *Antirrhinum majus*, forms white, somewhat sunken lesions on the stems and occasionally on the leaves of *A. orontium*.

NANNFELDT (J. A.). **Notes on type specimens of British inoperculate Discomycetes. (First part, notes 1–50.)**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 191–206, 1936.

Notes are given on the type specimens of 50 British species of inoperculate Discomycetes in the herbaria at the British Museum and Kew. The species discussed are arranged alphabetically according to the names in Ramsbottom's List of British Discomycetes (*Trans. Brit.*

mycol. Soc., iv, pp. 343–381, 1914) and most of them are stated to have been known, under different names, on the Continent.

The type specimen of *Trichoscypha calycina* var. *trevelyani* (Cke) Boud. (syn. *Peziza calycina* var. *trevelyani* Cke, *Lachnella calycina* var. *trevelyani* Phill., *Dasyscypha calycina* var. *trevelyani* Sacc.) shows that this fungus is identical with *Trichoscyphella willkommii* (Hart.) Nannf. (= *Dasyscypha willkommii* Hart.) [*R.A.M.*, xv, p. 693; xvi, p. 220]. The author found no spores larger than 24 by 8 μ, and the average size was 20 by 7 μ, typical for *T. willkommii*. He considers that the larger measures given by Cooke must be erroneous.

Canonaco (A.). **Contributo alla flora micologica dell'A.O.I. I. Micromiceti dell'Eritrea. II. Ustilaginee.** [A contribution to the mycoflora of Italian East Africa. I. Micromycetes of Eritrea. II. Ustilagineae.]—Reprinted from *Boll. Giard. bot. Palermo*, xiv, *1936*, 28 pp., 3 pl., 1936.

This annotated list of fungi from Eritrea, Italian Somaliland, and Abyssinia includes, *inter alia*, the following records of phytopathological interest: *Uromyces striatus* [*R.A.M.*, xiii, p. 290] occurred on lucerne, *Puccinia allii* [ibid., xv, p. 57] on garlic leaves, *P. pruni-spinosae* [ibid., xvi, p. 108] on almond and peach leaves, *Melampsora lini* on flax leaves, and *Phakopsora zizyphi-vulgaris* [ibid., xv, p. 401] on the leaves of *Zizyphus spina-christi* and *Z. jujuba*. *Pleosphaerulina briosiana* on lucerne [ibid., viii, pp. 604, 753] differed from the type in its larger spores which measured 24 to 32 by 10 to 12 μ. *Parodiella perisporioides* [ibid., vii, p. 679] was found on *Indigofera arrecta* leaves, and *Darluca filum* [see above, p. 237] was very common on the uredosori of Uredineae on various Gramineae.

Ascochyta jasminicola n.sp. [with a Latin diagnosis] causing a rounded zonate, leaf spot with dark margins, 5 to 8 mm. in diameter, on an undetermined species of jasmine, is characterized by elliptical or ovate, continuous, later uniseptate, hyaline spores measuring 6 to 8 by 4 μ. Other records are *Septoria lycopersici* [ibid., xv, pp. 538, 690] on tomato leaves, *Cycloconium oleaginum* on olive leaves [ibid., xiv, p. 706], and *Tilletia levis* [*T. foetens*] on wheat.

Fraser (Lilian). **Notes on the occurrence of the Trichopeltaceae and Atichiaceae in New South Wales, and on their mode of nutrition, with a description of a new species of Atichia.**—*Proc. Linn. Soc. N.S.W.*, lxi, 5–6, pp. 277–284, 2 pl. [facing p. 360], 10 figs., 1936.

The Trichopeltaceae and Atichiaceae are families of epiphyllous Ascomycetes considered by the writer to form part of the sooty mould complex [*R.A.M.*, xv, p. 530]. They are usually associated with other sooty moulds, the most important of which are the Capnodiaceae, and both are specialized, though very differently, for their environment, and do not appear to be closely related systematically. Evidence is presented showing that both families are saprophytic epiphytes dependent on scale insect excretions, without penetrating the host tissue by haustoria or other means.

Following a brief review of the systematic literature on the Trichopeltaceae, the author records, with annotations, *Trichopeltis reptans*,

Brefeldiella brasiliensis, and *Trichothallus hawaiiensis* for the first time in New South Wales, all chiefly on the leaves of rain-forest trees. Of the Atichiaceae *Atichia glomerulosa* (17 collections), *A. millardeti* (58), and *Phycopsis vanillae* (9) are also recorded for the first time from the same locality, and a new species, *A. botriosa*, is described, with a Latin diagnosis. The last-named was collected on *Callistemon pallidus* and is distinguished from all other species of the genus by the comparatively long and narrow branches of the propagulae, which are 1- to 5-, usually 3-branched, 55 to 75 by 10 to 14 μ, by the shape and method of branching of the thallus, and by the filamentous nature of the cells composing it.

Shih (Y. K.). **A taxonomic study of the genus Aspergillus around Wuchang, Central China (Hyphomycetes).**—*Lingnan Sci. J.*, xv, 3, pp. 365–378; 4, pp. 607–612, 1 pl., 1936.

Full descriptions are given of 42 species and strains of *Aspergillus* [including *A. laokiashanensis* n.sp. from leather, *A. chungii* n.sp. from the air, and 3 new varieties, for all of which Latin diagnoses are supplied] found near Wuchang, Central China, and identified by Dr. C. Thom. The habitat of each fungus is indicated and the paper concludes with a key for the identification of the species and varieties recorded.

Kari (L. E.). **Mikromyceten aus Finnisch-Lappland.** [Micromycetes from Finnish Lapland.]—Reprinted from *Ann. bot. Vanamo*, viii, 3, iv+25 pp., 1936. [Finnish summary.]

This annotated list of over 280 fungi (mostly rusts, smuts, Ascomycetes, and fungi imperfecti), collected in Finnish Lapland in 1925 and 1931, includes many new records and eight species to be described by Petrak as new to science in a forthcoming paper.

Goto (K.). **Sclerotium rolfsii in perfect stage. IV. Cytological observations.**—*Ann. phytopath. Soc. Japan*, vi, 2, pp. 101–118, 1 pl., 27 figs., 1 diag., 1936. [Japanese summary.]

An intensive study of the cellular and nuclear relations in *Sclerotium rolfsii*, which has shown the fungus to be predominantly plurinucleate, has given on the whole convincing proof that the variation previously reported in the perfect (*Corticium*) stage [*R.A.M.*, xv, p. 401] is a result of the segregation and recombination of hereditary factors in the course of sexual reproduction.

Subba Rao (M. K.). **Pink disease.**—*Bull. Tea sci. Dep. unit. Plant. Ass. S. India*, 10, 25 pp., 8 figs., 1936.

In this comprehensive account of pink disease (*Corticium salmonicolor*) [*R.A.M.*, xi, p. 768; xvi, pp. 1, 106] of tea in southern India the author states that the disease was observed on *Grevillea robusta*, coffee, dadap (*Erythrina lithosperma*), *Eucalyptus robusta*, *E. globulus*, *Melia azadirachta*, *Cinchona* [*calisaya* var.] *ledgeriana*, *C. succirubra* [ibid., x, p. 298], *Artocarpus integrifolia*, mango, *Jasminum* sp., and *Aleurites montana* (apparently a new host), as well as on tea. Examination of affected tea confirmed the observations of Brooks and Sharples on rubber both with regard to the basidial fructification often being sterile and

also to the irregular hymenial surface. On *G. robusta*, *M. azadirachta*, *A. montana*, mango, and *Eucalyptus* spp., however, the fructifications were fertile and the basidia were found to be arranged regularly. The fungus grew very well and with profuse coloration in culture on peptone cane sugar, potato dextrose, and lemco agar. Cultures on onion agar plus 2 per cent. gall-tannin developed a brown halo, indicating that the fungus is capable of destroying lignin.

Inoculations made in April, 1933, in dry weather conditions on wounded and unwounded tea branches gave negative results. Similar experiments carried out a month later, when a few showers were experienced, showed 8 successful inoculations out of 16, but the fungus made little progress. When freshly cut branches, however, were inoculated during the same period and kept moist, small, pink cushions appeared on them after a week and inoculations on a potted tea plant covered with a bell jar lined with moist paper gave a similar result. Continuous rain fell in June, when inoculations on potted plants in the open also gave positive results, and the inoculated branches died in October. It was concluded that the fungus is unable to progress in the dry season, that extremely humid conditions are necessary for infection, progress being checked by a dry period even after the fungus has become established, and that both healthy and wounded tissues are susceptible.

The disease generally appears during the rainy season, and becomes serious only on mature bushes. Usually the fungus is confined to the fresh growth that develops after pruning, but it may descend to the lower primary branches or the main stem, which, however, resist the attack. The diseased branches show cankered areas and the young branches may be killed. The disease was not found on China tea. The humid conditions necessary for the development of infection are favoured by the increasing age of the bushes since pruning, and the presence of shade trees. Experimental evidence showed that spraying infected bushes with agral shirlan without removing the diseased branches did not eliminate the disease, but when this precaution was taken before spraying the disease did not again appear during the succeeding rains, though neighbouring untreated bushes became infected.

WYCKOFF (R. W. G.) & COREY (R. B.). **X-ray diffraction patterns of crystalline Tobacco mosaic proteins.**—*J. biol. Chem.*, cxvi, 1, pp. 51–55, 1 pl., 1936.

Using a gas type X-ray tube with a chromium target capable of day and night operation at a power consumption somewhat in excess of a kilowatt, the authors obtained a series of powder diffraction photographs of crystalline tobacco mosaic virus proteins [*R.A.M.*, xvi, p. 212]. The patterns thus secured, with many sharp reflections between 80 Å. and 3 Å., are exactly those to be expected from true crystals composed of large molecules. No differences could be detected between the patterns of the proteins of the ordinary and aucuba strains of the disease, neither did the photographs undergo any alteration after nine successive recrystallizations. Tobacco mosaic virus protein completely inactivated by means of ultra-violet irradiation

[ibid., xvi, p. 213] and subsequently crystallized gave a photograph the principle diffraction lines of which agree with those of the active protein.

BEALE (HELEN P.). **Possible relationship of Stanley's crystalline Tobacco-mosaic-virus material to intra-cellular inclusions present in virus infected cells.**—Abs. in *Contr. Boyce Thompson Inst.*, viii, 4, p. 333, 1936.

In a piece of epidermis from the back of the midrib of a Turkish tobacco leaf affected with Johnson's tobacco virus 1 or 6 and treated with hydrochloric acid of approximately P_H 1·3 the author observed oblong, crystalline masses which developed cross striations and broke up into needle-shaped crystals that floated out free in the cells. The crystalline plates disintegrated into honeycombed, granular masses, which were the ends of the needle crystals with their long axes at right angles to the basal plane of the plate. In gross appearance the needles were indistinguishable from those formed upon acidification of virus extract purified by Stanley's method [see preceding abstract]. When excess acid was added after the needles had formed they went into solution, leaving the cell nucleus and X bodies intact. Intracellular precipitation of needle-shaped crystals was obtained with six different hosts of the viruses, and three different acids. Healthy Turkish tobacco plants and others affected with the tobacco ring spot virus or potato virus X gave negative results. The marked similarity in gross appearance of the needle crystals obtained in the cells and by Stanley's method, and their similar behaviour upon acidification, suggests a common source in the plate crystals.

LOJKIN (MARY). **Inactivation of Tobacco mosaic virus by ascorbic acid.**—Abs. in *Contr. Boyce Thompson Inst.*, viii, 4, p. 335, 1936.

The reduced form of ascorbic acid in concentrations of 0·03 mg. per c.c. completely inactivated purified preparations of the tobacco mosaic virus [see preceding abstracts], but inactivation occurred only when the acid in the virus solution was oxidized by atmospheric oxygen. The addition of copper catalysed the auto-oxidation and stimulated the inactivation. The virus remained active when oxidization was brought about in the absence of atmospheric oxygen by iodine, 2-6-dichlorophenolindophenol, and potassium permanganate. Dehydroascorbic acid did not inactivate the virus under the same conditions in which the reduced form produced inactivation. The virus in the whole juice was less readily inactivated than in the purified form.

HIRAYAMA (S.) & YUASA (A.). **Cytological study of Tobacco mosaic. II.**—*Ann. phytopath. Soc. Japan*, vi, 2, pp. 119–128, 12 figs., 1936. [Japanese, with English summary.]

Mosaic tobacco plants produced 88·91 per cent. apparently normal pollen grains (36·20 per cent. of which failed to germinate on an agar medium with 5 per cent. glucose) and 11·09 per cent. degenerate ones, the corresponding figures for healthy plants being 88·34 and 11·66 per cent., respectively; 47·56 per cent. of the healthy, normal grains were unable to germinate. Seeds obtained from crosses between diseased and healthy

plants and from self-pollination were largely abortive, not on account of the abnormality of pollen grains or ovules in the former, but possibly due to Kostoff's 'female sterility' [virus: *R.A.M.*, xii, p. 600; xv, p. 754]. Most of the normal seeds, on the other hand, were germinable. Tobacco plants inoculated with the expressed juice (boiled for 15 minutes) of diseased plants showed neither mosaic symptoms nor X-body formation [ibid., xv, p. 322], so that the latter is evidently a function of the active virus and not of the inactivated principle in the expressed juice. Amorphous structures simulating X-bodies developed in the cytoplasm of healthy plants grown in nutrient solutions containing 0·05 per cent. ammonium molybdate, or the same amount of lactic acid [ibid., xiv, p. 51].

Gratia (A.) & Manil (P.). **Pourquoi le virus de la mosaïque du Tabac et le virus X de la Pomme de terre ne passent-ils pas à la descendance par les graines?** [Why are the Tobacco mosaic and X Potato viruses not transmitted to the progeny through the seed?] —*C.R. Soc. Biol., Paris*, cxxiii, 29, pp. 509–510, 1936.

Previous experiments having established the non-transmissibility of the tobacco mosaic and X potato viruses through the seed [*R.A.M.*, xvi, pp. 52, 67], the writers sought to ascertain the basis of this fact by an examination of extracts of the pollen grains of healthy and mosaic tobacco, and of healthy and X potato-infected *Datura*. Precipitin tests of extracts in physiological solution from pollen grains commencing germination by means of antisera of healthy and diseased plants showed the viruses to be absent from the pollen grain, and other tests showed the anthers also to be uninfected. Similar extracts were then prepared from the green calyx, the discoloured pink corolla, the white stamens, and the pistil of a mosaic tobacco plant. The tobacco mosaic antiserum flocculated the calyx juice in ten minutes and that of the corolla in two hours, but the juice of the stamens and pistils both reacted negatively. Evidently the virus gradually becomes attenuated and ultimately disappears during the differentiation of the floral organs. The transmission or non-transmission of viruses would not appear, therefore, to involve a problem of heredity but merely to represent an instance of the very erratic behaviour of these infective principles in regard to localization in the various plant organs.

Hill (A. V.) & Angell (H. R.). **Downy mildew (blue mould) of Tobacco: prevention of its development in inoculated and infected seedlings by benzol.**—*J. Coun. sci. industr. Res. Aust.*, ix, 4, pp. 249–254, 1936.

In further experiments in the control of tobacco downy mildew (*Peronospora tabacina*) [*R.A.M.*, xvi, p. 131] the disease was prevented by keeping the seedlings in benzol vapour continuously from the time of inoculation for three to six days. More effective control of the fungus is obtained apparently by intermittent than by continuous exposure to benzol, and the practice of removing covers from seed-beds on fine days is not likely to result in disease development. In another series of experiments seedlings in which mycelium was present were exposed to benzol vapour for eight days (sometimes less) and the plants

remained healthy after the benzol was removed for 14 or more days, so that it is concluded the fungus in the tissues was inactivated or killed. Used after sporulation had begun, benzol almost prevented the further production of conidia. The data obtained showed that it is very important to prevent, as far as possible, contamination of seedlings from diseased plants during the last week in the seed-beds.

SHARP (A.). **Tobacco seedbed covers.**—*J. Dep. Agric. W. Aust.*, xiii, 2nd Ser., 4, pp. 503–507, 1 fig., 1936.

In tests carried out in Western Australia in 1936 with various types of covers for use on tobacco seed-beds treated with benzol against downy mildew [*Peronospora tabacina*: see preceding abstract] calico treated with linseed oil was the most satisfactory as regards seedling growth, but became unfit for further use by the end of the season. The best results were obtained by using a fairly cheap, unbleached calico treated with a solution made up of 12 lb. 125°/130° paraffin wax, 1 lb. clear petroleum jelly, 1 pint boiled linseed oil, and 2 galls. mineral turpentine.

SHEFFIELD (F[RANCES] M. L.). **The histology of the necrotic lesions induced by virus diseases.**—*Ann. appl. Biol.*, xxiii, 4, pp. 752–758, 2 pl., 1936.

In the experiments discussed in this paper the leaves of *Nicotiana glutinosa* plants were inoculated with tomato aucuba mosaic [tobacco virus 6: *R.A.M.*, xvi, p. 66] when they were about 10 cm. long, i.e., after cell division had normally ceased in them two or three weeks previously. Histological examination showed that about 12 hours from inoculation a band of dark staining material began to form between certain of the cell walls, most frequently between the cells of the lower epidermis and those of the spongy parenchyma; occasionally, however, this band first appeared between the palisade cells, spreading rapidly downwards from towards the upper to the lower side of the leaf. Simultaneously with the formation of this band nuclear division was observed in the spongy parenchyma cells within it, but it was not followed by cell division. As the necrotic band extends, the cells within it die and dry out, and in about three days the lesion consists of a meshwork of this necrotic material, within which the virus is isolated from all interchange between the infected and healthy parts of the leaf. The necrotic material was found to be insoluble to concentrated acids and alkalis, and did not react with any of the more common reagents.

SHAPOVALOV (M.) & DUFRÉNOY (J.). **Un virus infectant des Solanées et des plantes d'ornement dans le sud-ouest de la France.** [A virus infecting Solanaceae and ornamental plants in the south-west of France.]—*C.R. Soc. Biol., Paris*, cxxiii, 31, pp. 696–698, 1 fig., 1936.

Spotted wilt is stated to be common on tomatoes in the south-west of France, where it is chiefly conspicuous by the development on the fruits of sharply defined white or yellowish spots, as described by Petri from Sicily. The expressed juice of green fruits is infectious but not

that of ripe ones. The virus persists during the winter in dahlia rhizomes [*R.A.M.*, xv, p. 444] and in the spring is carried by the larvae of *Thrips tabaci* to annuals, such as tomato and tobacco. Pale-flowered dahlias are particularly susceptible to spotted wilt and rapidly degenerate under its influence. Though normally systemic infection may sometimes be restricted to the primary lesions or it may extend, in the case of young plants, along the leaf veins and stems in the form of necrotic areas, this phase being known as 'canker' in tobacco and 'die-back' in tomatoes (U.S.A.) [ibid., xiv, p. 201]. In the Compositae, e.g., dahlia and *Callistephus chinensis*, the cells of the affected region contain a refringent spherical inclusion in the vacuolar solution, staining with Sudan III.

NEWTON (W.). **Virus studies. II. Streak X, a disease of Tomatoes caused by a virus of the Potato X group unassociated with Tobacco mosaic.**—*Canad. J. Res.*, xiv, 11, pp. 415–418, 1 pl., 1936.

A tomato streak disease caused by a virus of the potato X group unassociated with tobacco virus 1 greatly reduced the yield of marketable fruit in several greenhouses near Victoria, British Columbia. The symptoms consisted in a pronounced striping and necrosis of the stems and leaves, with blotching of the fruit, and thus resembled those of 'experimental streak' induced in tomatoes infected with tobacco virus 1 and re-inoculated with the potato virus X [*R.A.M.*, xv, p. 123].

The host range, lethal temperature (65° to 70° C.), longevity *in vitro* and dilution extinction point of the virus ('streak X') resembled those of the ordinary potato virus X [see above, p. 270]. Streak X is distinguished from the latter by the more pronounced symptoms it induces in tobacco (conspicuous multiple rings with secondary net-like mottle and necrosis), *Datura stramonium*, *Nicotiana glutinosa* (both mottle followed by necrosis), and tomato, and particularly by the streaking and necrosis it causes in the stems and leaves of the last-named. The absence of local lesions of tobacco virus 1 on *D. stramonium* and *N. glutinosa* established the disease as distinct from any form of Ainsworth's streak group [*R.A.M.*, xiv, p. 261].

Streak X virus could not be recovered from inoculated apparently healthy Irish Cobbler potatoes [carrying virus X] after 10 days' incubation, and tomatoes infected with the ordinary virus X were completely immunized against it. On the other hand, the virus was recovered unchanged from inoculated X-free potato seedlings. The precipitin reaction also demonstrated that it belongs to the potato virus X group.

GRIEVE (B. J.). **A staining and maceration method of tracing the path of the vascular bundles in herbaceous plants, and its application in observations on the distribution of Bacterium solanacearum in relation to epinastic curvatures in petioles of Tomato and Potato plants.**—*Proc. roy. Soc. Vict.*, N.S., xlix, 1, pp. 72–74, 1 pl., 1936.

In experiments designed to show the relation between *Bacterium solanacearum* and epinasty and root formation in infected tomato and potato plants [*R.A.M.*, xv, p. 539; xvi, p. 201] the stems were severed at the base and the plants placed in 1 per cent. solutions of eosin or basic fuchsin for one to two hours until the dye was visible in the

topmost leaves. The petioles were then cut off, the epidermis slit, and the plants immersed in boiling nitric acid (15 per cent.) for a few seconds in the case of tomato stems and one to five minutes in that of well-developed potato stems. After washing in running water for ten minutes, the plants were allowed to stand in water overnight. The epidermal and cortical tissues could then be easily dissected away. The vascular tissue and the dyes were unaffected by the acid, so that the path of the bundles was clearly evident. Vessels clogged with bacteria failed to allow the passage of the stain, and on dissection the infected bundles were yellow and the non-invaded vessels red. By this means it was possible to trace the time of development of the adventitious roots along the infected stem and to determine their relationship to the bacteria.

SOMMER (H.). **Nochmals: Ahornsterben in der Baumschule.** [Another note on the dying-off of Maples in the nursery.]—*Blumen u. PflBau ver. Gartenwelt*, xl, 47, pp. 566–567, 1936.

Verticillium albo-atrum is thought to be probably responsible for a considerable proportion of the mortality among nursery maples [*Acer* spp.: *R.A.M.*, xiv, p. 265; xvi, p. 217] in Germany. Other hosts of the fungus include *Prunus* and *Spiraea*. Control should be based on a rational scheme of crop rotation, supplemented by the immersion of the maple roots, prior to planting, in a loam emulsion with the admixture of 2·5 gm. uspulun per l.

LAUBERT (R.). **Die Blattfallkrankheit der Pappeln.** [The leaf fall disease of Poplars.]—*Kranke Pflanze*, xiii, 11, pp. 196–197, 1936.

Nursery poplars in the Mülheim (Ruhr) district and elsewhere in Germany were attacked by *Marssonina populi-nigrae* [*Pseudopeziza populorum*: *R.A.M.*, xv, p. 618] and *M.* (*P.*) *populi-albae* [ibid., xi, p. 136] the former affecting *Populus nigra*, *P. balsamifera*, and other representatives of the same group, while the latter was confined to *P. alba*. The fungi produce exclusively on the upper leaf surfaces, chiefly of the annual shoots and lower branches, numerous dingy brown to blackish spots of varying dimensions with ill-defined or fimbriate margins, resulting in premature defoliation.

HIGGINS (B. B.). **Morphology and life history of some Ascomycetes with special reference to the presence and function of spermatia. III.**—*Amer. J. Bot.*, xxiii, 9, pp. 598–602, 13 figs., 1936.

The morphology and life-history of the fungus known as *Cercospora liriodendri*, the agent of a dark brown, angular leaf spot and partial defoliation of tulip poplars (*Liriodendron tulipifera*) in the Middle Atlantic and Gulf States, has been followed throughout the year. In addition to the conidial stage described by Ellis and Harkness (*Bull. Torrey bot. Cl.*, viii, p. 27, 1881), the fungus produces during the late summer and autumn ovate to globose or depressed-globose, black spermogonia, 45 to 75 by 40 to 70 μ, rod-shaped, hyaline spermatia, 2 to 3 by 0·5 to 1 μ, ovate to subglobose, black, ostiolate perithecia, 45 to 91 by 45 to 72 μ, and cylindrical, clavate, short-stipitate, fasciculate, aparaphysate asci, 33 to 44 by 6 to 7 μ, containing eight cylindrical,

straight or slightly curved, blunt or tapering at the ends, uniseptate ascospores, 9·6 to 16·8 by 2·5 to 3·5 μ. The spermogonia mature and usually cease to produce spermatia by December, whereas perithecial formation is not concluded until the following spring. The clavate to elliptical, pale olivaceous, uni- to tri-septate conidia, 14·4 to 34 by 5 to 7 μ, are borne on fasciculate, basally branched, sparsely septate, thin-walled, apically geniculate, brown conidiophores, 72 to 132 by 3·6 to 5 μ. Cultures from ascospores and conidia were similar in every respect but remained sterile. Evidence of a genetic connexion between the two stages was obtained, however, by placing ascospores directly on *L. tulipifera* leaves and tracing the development of the typical brown lesions associated with the imperfect phase, as well as by the observation of young perithecia and spermogonia forming at the base of the conidiophores. The fungus is renamed *Mycosphaerella tulipiferae* (Schw.) n.comb., syn. *Sphaeria* (*Depazea*) *tulipiferae* Schw., with revised diagnoses in English and Latin.

Hirt (R. R.). **A simple device for recording the time and duration of rainfall.**—*Phytopathology*, xxvi, 11, pp. 1064–1067, 1 fig., 1 diag., 1936.

The apparatus devised by the writer for registering the time and duration of rainfall in relation to the infection of white pine [*Pinus strobus*] by *Cronartium ribicola* [*R.A.M.*, xvi, p. 219] consists essentially of recording sheets divided by mimeographed radial lines into hours and half hours, with three concentric lines drawn with indelible lead near the outer edge of the sheet. The record sheets were mounted on a revolving brass disk substituted for the hour hand of a clock. The apparatus was provided with a removable cover made from heavy roofing paper, in which a slit 2 in. long was cut directly over the circles, each end of the slit being $\frac{1}{48}$ of the circumference of the circle made by it during rotation, so that an interval of 15 minutes was required for one radial line of the sheet to pass the opening. When it rained, water fell through the slit and stained the indelible lines on the portion of the record sheet exposed beneath. The instrument was tilted slightly forward so that the water ran rapidly off and did not blur the sheets.

Snell (W. H.). **The relation of the age of needles of Pinus strobus to infection by Cronartium ribicola.**—*Phytopathology*, xxvi, 11, pp. 1074–1080, 1936.

With the ultimate object of giving definite dates of past epiphytotic outbreaks of *Cronartium ribicola* [see preceding and next abstracts] and of correlating waves of infection with meteorological conditions, experimental studies were carried out in New Hampshire and New York, involving (1) the artificial inoculation with *C. ribicola* of potted white pines (*Pinus strobus*), (2) the exposure of potted pines to natural infection, and (3) observations of cankers on young planted pines. The results generally tend to support the view that the current season's needles, in contrast with those of *P. monticola* [*R.A.M.*, xiii, p. 283], show a varying degree of enhanced susceptibility towards the rust as compared with those of the second season. The question cannot, however, be regarded as finally settled pending the accumulation of

further and more convincing evidence. In this connexion attention is drawn to the inadvisability of experimenting on trees potted in the same season, since the transplanting operation is liable to weaken their vigour and so minimize the likelihood of infection, the rust preferring a thriving host.

LIESE (J.). **Zur Frage der Vererbbarkeit der rindenbewohnenden Blasenrostkrankheiten bei Kiefer.** [On the question of the heritability of the blister rust diseases of Pine.]—*Z. Forst- u. Jagdw.*, lxviii, 11, pp. 602–609, 1936.

This is an amplified account, embodying supplementary data relating to recent experiments, of the writer's studies on the heritability of *Cronartium asclepiadeum* (*Peridermium pini*) on Scots pines (*Pinus sylvestris*) in north Germany [*R.A.M.*, x, p. 351; xi, p. 486; xiv, p. 339], the transmission of susceptibility to which by the seed may now be regarded as definitely established. Great importance attaches to these observations from the standpoint of practical silviculture, since it is obvious that the seed from diseased trees, however desirable in other respects, must be absolutely barred as propagation material. It is particularly unwise to make use for this purpose of cones indiscriminately collected in the course of felling operations.

The author considers it probable that susceptibility to *C. ribicola* in the case of *P. strobus* [see preceding abstracts] is similarly inherited.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 12, pp. 263–264, 269–271, 1936.

AUSTRIA (Federation). As from 16th April, 1936, the following countries are considered to be free from potato wart (*Synchytrium endobioticum*) for the purpose of supplying fresh tubers for Austria [*R.A.M.*, xv, p. 464]: Egypt, Italy, Jugo-Slavia, Malta, Cyprus, Spain, and Hungary [cf. ibid., xv, p. 752].

AUSTRIA (Salzburg). By the terms of Decree No. 76 of 7th April, 1936, it is incumbent upon garden-owners or occupiers to eradicate all junipers [*Juniperus sabina*] infected by pear leaf cluster-cups (*Gymnosporangium sabinae*) [ibid., xv, p. 103] and growing in the vicinity of pear trees.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*NachrBl. dtsch. PflSchDienst*, viii, 9, pp. 198–206, 1936.

MOROCCO (French zone). A Vizirial Decree of 1st August, 1936, published in the official bulletin (1,244) on the 28th and coming into force three months thereafter, provides that all tomato, eggplant, and potato consignments entering the French zone of Morocco must be accompanied by properly authenticated certificates vouching for the cultivation of the above-mentioned plants in areas more than 20 km. distant from any focus of wart disease (*Synchytrium endobioticum*) [*R.A.M.*, vii, p. 815; xvi, p. 144]. In the case of potatoes the distance may be reduced to 5 km. on production of satisfactory evidence that the consignments have been inspected in the country of origin and found free from infection.